THE
ELECTRICAL REVIEW

Volume CXXVI. No. 3261

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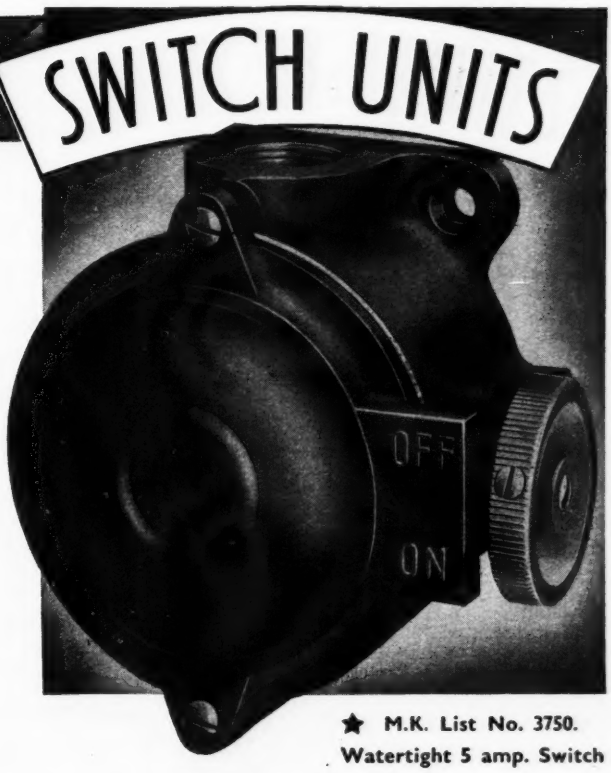

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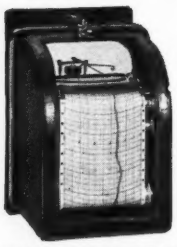

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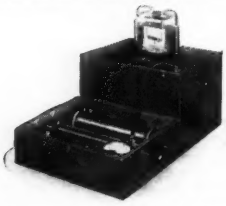

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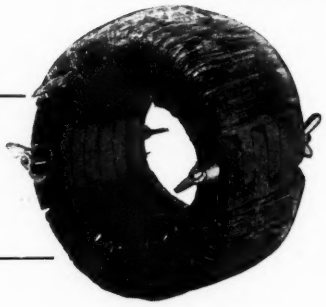

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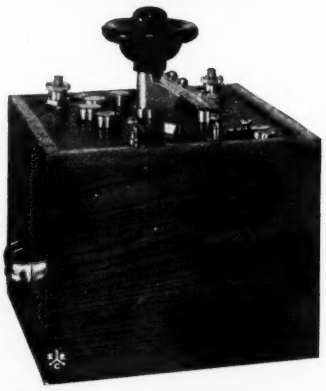

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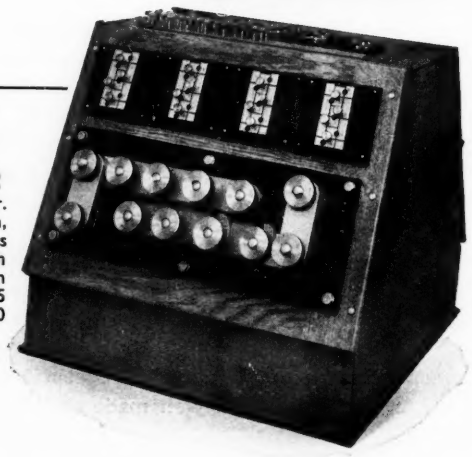

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THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXVI. No. 3261 MAY 24, 1940 Price SIXPENCE

Fostering Overseas Trade

Export Council and Manufacturers

THE reappointment of Sir Andrew Duncan as President of the Board of Trade will be considered very satisfactory by the electrical industry, which had the advantage of his services for a number of years. The industry will now look forward, with others, to an intensification of the export drive.

The summary of overseas trade during April issued by the Board last week showed that, so far as electrical goods and apparatus were concerned, it was a record month, exports reaching a total value of £1,356,688, as compared with £922,705 in April, 1939. As electrical machinery is hidden in the general classification of "Machinery," it cannot be ascertained how that branch fared; the total for April, 1939, was £515,251.

It is pertinent to ask, now that the Export Council has been in existence for about three months, what is being done officially to increase exports. The answer is, of course, that, in the first place, the Export Council is encouraging or driving manufacturers and merchants to give greater attention to overseas markets and to form Export Groups. Secondly, it is endeavouring to ensure the supply of the necessary raw materials, through the agency of these Groups, to enable export orders to be executed. Further than that it has not yet been able to go.

Not an Exporting Organisation

The Council was rather expected by some to act as a kind of export organisation, securing orders, allocating them, and arranging for delivery of the goods and collection of the money due. It is obvious that no official body tacked on to our existing system could do any of these things. In short, its action is practically limited to helping manufacturers to help themselves. In the practical direction of ensuring the supply of materials the Council has been of great assistance, particularly in the matter of iron and steel, and we believe that electrical manufacturers are experiencing little difficulty now in obtaining materials for export orders, provided they go the right way about it.

When it tackled the formation of Export Groups the Council had, naturally, to approach the existing trade associations; any attempt to bring together the many units in any particular industry would have taken months, or even years. As a result, between seventy and eighty Groups have now been formed. In the electrical industry there are already eight (apart from others not wholly but substantially interested in the industry), and the two principal ones have set up sectional groups, as we explain on another page of this issue. By this means practically the whole of the industry is now catered for in a way that ensures that each class of goods is in the hands of men thoroughly experienced in that class.

In a recent address Sir Clive Baillieu, an executive member of the Export Council, sought to allay the fears of non-associated manufacturers that this was possibly an attempt to rope them into associations. He said that membership of the electrical industry Export Groups was in no way dependent upon membership of any association. The only qualification was the capacity and the desire to export. He also stated that after a given time non-membership of an Export Group would be regarded as a declaration that the firm concerned was not interested in export.

The Industry's Responsibility

It is evident, then, that the industry itself is called upon to shoulder the responsibility of expanding our overseas trade. It must itself seek outlets in all parts of the world and quote prices acceptable to buyers. It will be the task of the Export Committees and Groups to see how they can best aid their members in the pursuit of this aim. They are already prepared to see applications for materials through, and they can in other ways act as intermediaries between individual concerns and Government Departments. Sir Clive Baillieu mentioned the possibility of the pooling of resources. This is a somewhat more difficult matter, but it may be that occasions will arise when mutual aid will be very desirable, and no doubt full consideration will be given to the possibility.

We feel sure that it is true to say that the world still wants our electrical goods. The disappearance of Germany from important overseas markets has left a large gap to be filled which we must not leave to neutrals if we can help it. Although the increase of exports to help pay for the war is the paramount consideration, the necessity for retaining and strengthening our overseas trade connections until peace comes must always be borne in mind.

Speeding Up Production

THE conference on industrial lighting held on Wednesday at the E.L.M.A. Lighting Service Bureau was of particular significance in view of the efforts that are being made to speed up the production of war materials. How vital is the question of good lighting was emphasised by Mr. Lingard in a lecture on "Lighting for Wartime Production." Recent tests, he pointed out, had shown that in carrying out a particular task three men could do the work of four by increasing the illumination from 2 to 20 ft.-candles, and accuracy was greatly improved. In the production of armaments speed is more important than cost, but in any event it is clear that the expenditure on improved lighting is more than met by the higher output and better quality; Mr. Lingard showed that in the example quoted the cost was paid for twenty times over.

Black-out Ventilation

HURRIEDLY contrived schemes for preventing the emission of light from factory buildings have in a very large number of cases prevented the emission of stale air also. Even where vents have not been blocked but have been fitted with light traps the air flow may be halved and the number of changes of air per hour often falls far below the six or so regarded as a minimum for healthy conditions. In any case, the discomfort is likely to impede production, and a publication of the Factory Department, Home Office, entitled "Factory Ventilation in the Black Out" (Stationery Office, 3d.), urges the need for a restoration of the standards accepted before the outbreak of war, suggesting, with the aid of sketches, various methods of doing so. In many instances mechanical ventilation will be found necessary, and plenum and unit heating systems, particularly where long hours are worked, should be considered. The advantages of the easily installed unit systems with thermostatically controlled electric heating elements were recently discussed in these columns. It is essential that the design of ventilation schemes should be left to specialists and for operation to be assigned to a competent employee.

Commercial Refrigeration

WE report elsewhere in this issue the formation of a Commercial Electric Refrigeration Association (C.E.R.A.), which has been organised to promote and protect the business in commercial electric refrigerators and equipment, and to establish and maintain fair conditions of sale and distribution. From the list of concerns which have elected to become members it will be seen that the Association is representative of the leading manufacturers of electric refrigerators in this country. This section of the electrical industry has long since been one of considerable dimensions and importance, and the new Association should, in addition to assisting its members, prove of considerable value in furthering the extension of the commercial electric refrigerator industry.

High-voltage Cable

SEVERAL designs of high-voltage cable have been produced in this country during recent years with a view to overcoming the ionisation troubles caused by the formation of voids in the dielectric during cyclic expansion and contraction with load variations. Oil-filled cables for 132 and 66 kV have long been in use on the grid, those of the lower voltage now being of three-core construction. Results with 132-kV internal-nitrogen-filled cables laid in 1937 have proved so satisfactory that two further sections are to be installed by the C.E.B., which has also recently ordered a new type of 66-kV external-nitrogen-pressure cable. A short while ago we reported that a British impregnated-pressure cable had proved its ability to stand up to tests at 350 kV on the Continent. The latest introduction in the high-voltage range is a cable produced in the United States in which substantially complete contraction in every cycle is claimed to be effected by the use of a highly elastic oil-impregnated paper in the outer layers of the insulation. While high-voltage underground cables are limited in their scope by charging-current difficulties, they have a growing field for local connections, where the need to carry heavy loads precludes the use of lower voltages.

The E.I.B.A.'s Appeal

UNTIL the outbreak of war the Electrical Industries' Benevolent Association was on the up-grade. At the end of August its receipts had shown a rise but by the close of 1939 the total was about a thousand pounds down. Thus it is faced with the prospect of reduced funds at a time when appeals for assistance will inevitably be much greater and a special effort is called for from all who realise the value of the Association's services as well as those who have not yet given the matter proper consideration. It will be seen from the report which we publish in this issue, that a number of ways in which funds might be raised are suggested. The one with the greatest potentialities seems to be to enlist the aid of more of the workers in the industry for whose benefit the Association exists. At present, it is said, only about 6 per cent. of the non-manual workers are members. One other point in the report is worthy of comment. In the past it has sometimes been suggested that the Association's administrative expenses absorbed too large a proportion of the income. Critics should be satisfied that efforts are being made to improve the situation by the statement that general expenditure was reduced by £430 last year, although a greater amount of assistance, monetary and otherwise, was rendered.

Naming Instruments

LOGIC requires that electrical instruments which have achieved accuracy in measurement within very fine limits should themselves be accurately named in regard to their several functions, and in commenting on the Physical Society's exhibition last year we noticed a distinct trend in this direction. Nevertheless, this tendency has not kept pace with the rapid developments of the past few years, and to many users the trade name of an instrument reveals nothing of its purpose. Worse still, it often conceals the fact that an instrument for some special purpose is actually in production. A suggestion made by Mr. J. W. Williamson in the *Journal of Scientific Instruments* is that the names proposed for instruments should be approved by an authoritative body. Since such a procedure would have an international bearing, when the situation permits, it would appear to be a task for a committee of the British Standards Institution.

Reciprocity

UPON a number of occasions we have referred to the aspirations of some of our Dominions to render themselves independent of outside suppliers in the matter of manufactured goods. The movement has gone some way in New Zealand and in a recent issue of the *New Zealand Electrical Journal* the suggestion is put forward that not only should the Dominion be able to satisfy its own electrical requirements but that it should go further and supply light electrical equipment to Eastern markets. It is realised that it is not possible for New Zealand to attempt to produce heavy equipment. While we are bound to admit the right of the Dominions to do as they please in the matter of manufacture and export, we must point out again how difficult it is for us to pay for the Dominions' primary products if we cannot sell them our manufactured goods.

Payment for Whit-Monday

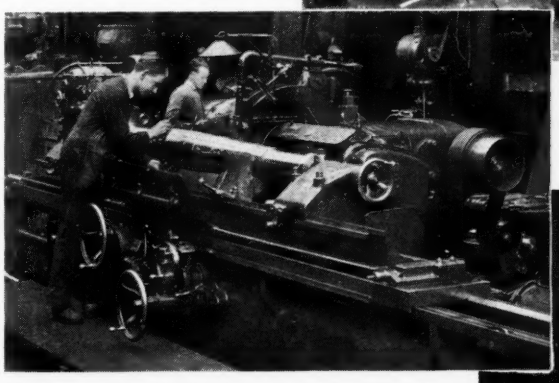
THE cancellation of the Whit-Monday Bank Holiday has naturally raised the question of payment for work done on that day. In the electrical contracting industry it is customary to pay time and a half for Bank Holidays. The National Federated Electrical Association circulated a direction to its members last week that in the circumstances Whit-Monday was to be regarded as an ordinary working day. The Electrical Trades Union, however, contends on behalf of all its members that the notice given was insufficient and that the terms of agreements should be fulfilled

MANUFACTURING METHODS

Considerations in Large-scale Production

THE general idea that a mass-produced article is necessarily one of low quality appears to be particularly prevalent in some quarters of the electrical industry. We have tried to find out why this is so, but the replies to our question appear always to lead to the inconclusive argument that because a certain article is to conduct or use electricity in some way it must be given individual treatment in its manufacture. We do not subscribe, for the purposes of this article, to the fuller ideas of the "complete mass-production" enthusiast, such as full mechanisation of production and production from absolute raw materials.

Before dealing with the advantages of mass production it will be helpful to try to explain some of the prejudices against it. We believe that the creative instinct in most of us leads to a natural sympathy towards the old craftsman who is believed to have been replaced by the machine, and after fostering this idea it is but a short step to the belief that the hand-made article is the acme of perfection. But it must not be supposed that machine production removes the need for craftsmanship; rather should it be said that the craftsmanship is transferred from the production of the article to the creation of the tool by which it is produced. We believe it is reasonable to suggest that an early reason for mechanised production was the difficulty of training the additional craftsmen necessary to cope with increased demands for certain products, and when one sees the modest beginnings of manufacture by machinery—merely jigs to assist the craftsmen, which are still common to-day—one must regard the change from craftsman to machine as evolutionary rather than revolutionary.



Another prejudice has a social bearing. It is asked: "Has not the skilled creative labour been replaced by unskilled labour?" We have already shown how the craftsman has been transferred rather than replaced, and we look upon the machine operatives as "trained" rather than unskilled, so that a definite uplift has taken place among the lower class of labour.

Again, to many minds the term mass production implies something "cheap and nasty," simply because many low-quality articles, particularly electrical apparatus, are essentially mass produced. But we shall make it clear later that while any mass-production system can be designed to produce any quality of article, the tendency is definitely towards a higher-quality product. Any reduction in quality should be regarded as an abuse of the system. Then we have another objection to mass production—lack of individuality. Distinction, exclusiveness, call it what you will, is the major justification for individual production which we advocate in its particular field just as strongly as we advocate mass production in its own sphere of pure utility. How is mass production helping the electrical industry? Instead of this we might ask: What is the ultimate aim of mass production? The answer is the same: Increase of business by means of price reduction. And price reduction is effected by greater production at correspondingly lower manufacturing costs. Without taking the subject to its final commercial issue, then, the determining factor in deciding on mass production is quantity.

Apart from those deplorable instances where the mass-production scheme is deliberately designed to a low standard, we can show that low selling price and high quality go hand in hand. Most electrical accessories entail considerable assembly in their production, and it will be obvious to all that perfect fits of the components—part to part and part to whole—necessarily lead to low assembly and hence production and selling costs. It is of the greatest importance to the manufacturer to have materials of the highest possible quality, and here again the connection with low costs is plainly seen. Easy workability of the raw material is the greatest contribution to easy machining, and machine stoppages always rank high in the list of causes of high production cost.

The greater the speed of mass production the greater must be the demands on the raw material, and because as the result of this fact mass production necessarily forces the manufacturer to give greater attention to the specification of his product, it can be seen that quality actually increases with the speed of production. If, for instance, for a certain component the speed and hardening limits are fixed to give a certain

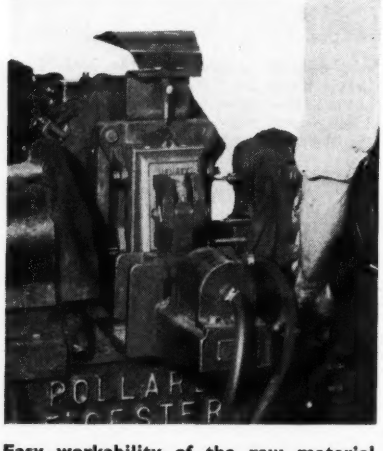
Left: Lack of quantity nearly always dictates individual production; 13-in., 3-ton shaft for 2,000-HP motor being processed in the Bruce Peebles works. Above: Armature winding can be definitely repetitive; Haefely moulding machines producing diamond coils in the same works

The last word in mass-production in the lampworks is a finishing group of six machines which, fed with the various glass and wire components, produce the finished lamps in their cartons; the finishing group at the G.E.C. Wembley lamp works

result, then the quality of the material must be absolutely right.

In the manufacture of large switchgear it is conceivable that a craftsman may easily and reasonably introduce a part which is not absolutely true to specification, but this could not possibly occur under mass production. An outstanding feature of any well-designed mass-production system is the ease with which inspection can be interposed at various stages in the "flow," and we believe that a representative ratio for electrical mass production is 1 to 10, *e.g.*, 100 inspectors to 1,000 operatives, which is an expensive adjunct, considered by itself. We can also regard the individual responsibility in the final testing of the product as the climax of the mass-production system.

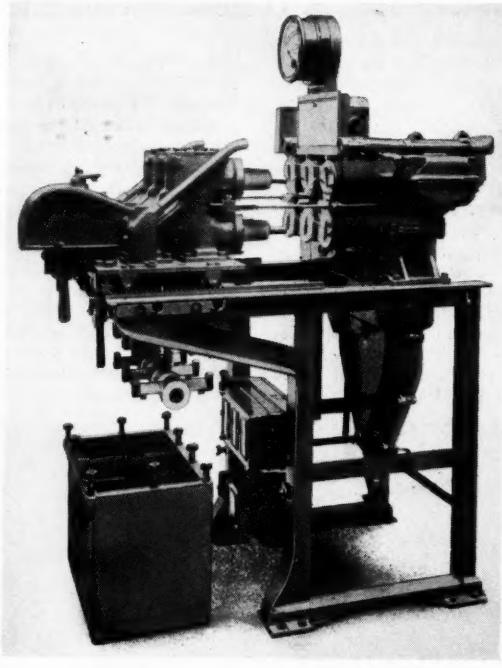
We have already shown how any well-designed mass-production scheme is essentially one of specialisation — specially trained operatives, special machines, special materials, special inspection, and so on. Yet within the framework of mass production specialisation is sought after still further, and one sees this idea expressed in separate self-contained factories, distinct from the main works, designed solely to produce a component or bank of components which is later to take its place in the mass-production flow. Another form of specialisation with regard to components is the treatment of faults, and we were very impressed by one large manufacturing concern's system of complaints classification—breakages in transit (electrical and mechanical) works and stores defects, &c. According to the classification, troubles can be traced easily to their source, and the resultant rectification means a constant increase of the production standard. In 1923 the treatment of faults cost 1s. 6d. per £100 of sales; last year the cost was 1d. per £100 sales. The importance of these comparative figures lies in the fact that during the intervening years mass production and specialisation have been raised to a present very high stage of perfection.



Easy workability of the raw material facilitates machining ; multiple drilling of switch cases in M.E.M. works

It is obvious that mass production is closely linked with standardisation, and the ideal mass-production scheme envisages just one product only and one production line. Actually the conditions in this country usually involve a few articles in the standardised range which are produced either separately in factories designed nearer to the mass-production ideal, or from several flow lines in one factory. Market research plays a very big part in linking up standardisation with mass production, and in the well-conceived scheme every effort is made from such research to include every possible attribute in the original design. To take a narrower view, however, any mass-produced article is necessarily standardised within its own limits of production, and one of the first aims of any production scheme is to fix the standard of quality. In one accessories factory with a very high degree of mass production it was explained to us that of the various forces at work in the production scheme the greatest was the chief designer, who insisted always upon a high standard.

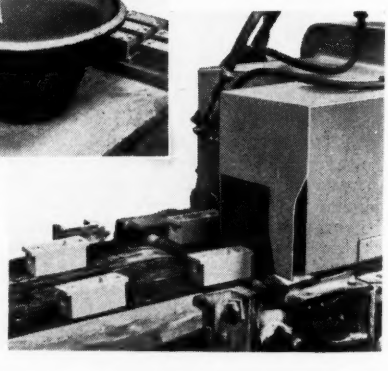
When fixing the design in the early stages the broadest possible view must be taken with regard to simplification, for this influences every aspect of production from the raw material; but simplification cannot and must not adversely influence the specification, for which precision and uniformity must be fundamental considerations. We are sure that the importance of uniformity is not appreciated fully in the electrical industry, and many mistakes have been made in connection with various products in aiming at one particular characteristic rather than at uniformity.



Metal-clad horizontal draw-out e.h.v. switchgear is a good example of batch production ; a Reyrolle unit

In forming an estimate of the extent of mass production in any one factory, a reliable guide is the proportion of general-purpose tools installed or used. If every tool in the place is a single-purpose equipment, then the factory can be styled "full mass production." The key to mass production is quantity, and the degree of "single purposeness" possible depends on quantity absolutely. One of the best examples of complete mass production is the electric lamp, at any rate for standard sizes. There are certainly no general-purpose tools in a modern standardised electric lamp works. The bulb-making machine which produces 7,000 bulbs per hour from "lumps" of molten glass sucked up from the furnace and gradually blown out to the shape of moulds on the rotary equipment illustrates admirably improvement achieved by the mechanisation of what was once regarded as exclusively a craftsman's job. But we believe that the last word in the mass-production scheme in the lamp works is a finishing group of six machines which, fed with the various glass and wire components, produces the finished lamps in their cartons. With the idea of continuous flow production in mind, there is probably no better example of electrical mass production than cable making. Laying up, lapping, stranding, and so on, are inherently line production processes.

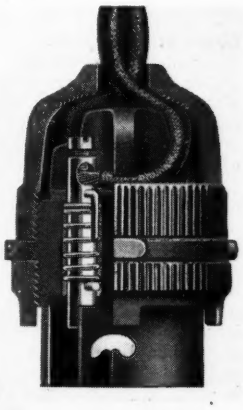
Many components are mass produced, irrespective of whether or not the term can be applied to the final product; for instance, screw and nut production on automatic machines in most engineering works. But the term can in addition be applied to particular processes, for example, drying after enamelling on the endless conveyor of a drying oven. The automatic cutting out of conductor slots in the laminations for rotary electrical equipment cores (stators or rotors) is obviously a flow process, and so is the multiple-punching of the tube holes in transformer plates. It was at first not easy for us to conceive armature winding as a mass-production process, but the Hæfely moulding machines and presses used in the manufacture of diamond coils for stator windings make it clear that the operation is definitely repetitive.

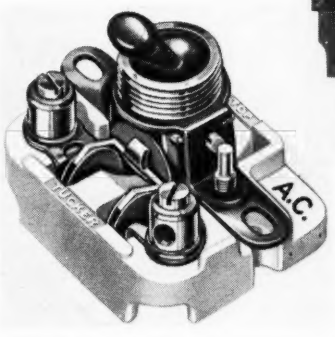


Electrical porcelain glazing by individual and mass production in the M.E.M. works

While lack of quantity nearly always dictates individual production, this is usually the result of the call for exclusiveness, such as is required in electric fires and electric lighting fittings. Mass production is definitely at a disadvantage when "fads and fancies" are introduced, and the domestic electric cooker is

a good example of how standardisation is rendered impossible by the individual demands of supply engineers. There is, however, another reason for individual production, namely, the impossibility of controlling the properties of certain raw materials. Rubber, mica, and some types of castings all call for individual treatment at times because of their inherently variable properties. On the other hand, certain materials deteriorate by standing, and, apart from the question of quantity, this represents a case for mass production. Certain receiving valves, for instance, have glass which must not be left to absorb moisture. Every electrical man will appreciate the absolute necessity of impregnating any insulation as soon as it is applied. Any operation which is controlled by time must necessarily give better results if it is *not* left to the human element, for instance, the stoving of enamels.





A good example of interchangeable manufacturing is the ordinary b.c. lampholder, a Tucker insulated model of which is illustrated above. Perhaps the most interesting example of accuracy in the manufacture of component parts is the production of the wide range of tumbler and type switches. That on the left is a Tucker 5-A AC flush design.

The full mass-production enthusiast will maintain that there is no half-way house to mass production, but, to take the broadest possible view, we must point to small-quantity production, such as the batch production of heavy-type switchgear. It is impossible to imagine feeder switches, for instance, being made in sufficiently large numbers to warrant single-purpose tools. In fact, this aspect is reflected in the design of such switchgear in that a very large proportion of the mass-produced parts are round and flat, to facilitate production on automatics by turning and grinding. We are thinking in terms of batches of anything up to 500, which can be repeated only once in, say, three months. Of course, the bigger the batch the nearer the approach to mass production, and it is often profitable for such components as contact pins and outlet boxes to be produced in larger quantities for stock.

Market research difficulties play a big part in the limitations of mass production. For instance, it is impossible for salesmen to forecast the probable long-period demand for gate-end switches, but orders to permit production in, say, batches of 100 can often be obtained, and this makes possible manufacture at a price at which such equipment will sell.

The necessity to produce component parts of accessories within such limits as to permit subsequent assembly without fitting or machining, as well as to ensure correct functioning of the final product, has resulted in a new outlook—interchangeable manufacturing. The feature of this is mass production of the components within closely defined limits and from high-quality material, to permit easy assembly with full interchangeability. The older method of individual fitting of parts practically prevented interchangeability and made the successful functioning of the final product dependent upon the skill, attention, and interest of an operative. Under such conditions the rate of output of a completed product was limited to the pace of the slowest operator, whereas with interchangeable manufacturing a balance can be maintained between the various tools and machines. A good example of interchangeable manufacturing is the ordinary b.c. lampholder, and the production method in question has permitted even finer limits than those of B.S.S.52. Such exactitude ensures interchangeability in assembly between components made at widely different times for use in batten, screw, and cord-grip patterns.

An example of proper concentration of skill is the production of bayonet-slots and indentations in lampholder liners. Perhaps the most interesting example of accuracy in the manufacture of component parts is the production of a wide range of tumbler-type switches. The only adjustment which is permitted in the assembly department is that of the contacts to ensure perfection with regard to contact area and pressure and millivolt drop.

For help in investigating the subject of this article we are indebted to Bruce Peebles & Co., Ltd.; Crompton Parkinson, Ltd.; the General Electric Co., Ltd.; the Midland Electric Manufacturing Co., Ltd.; A. Reyrolle & Co., Ltd.; and J. H. Tucker & Co., Ltd.

Electrical Export Groups

WE have already reported the formation of two Export Groups, or Committees as they are called, for the electrical industry under the Export Council's scheme for stimulating and increasing overseas trade. A preliminary statement has now been prepared setting out the proposed methods of operation.

It is stated, in the first place, that owing to the wide range of products covered by the electrical industry the two Committees decided that the best method of giving effect to the wishes of the Export Council would be by the establishment of Sectional Groups acting under the appropriate Export Committee. Such Sectional Groups will have special problems and difficulties that can only be solved by those in intimate contact with the particular product.

Under the Electrical Machinery Export Committee the following Sectional Groups are proposed:—Steam turbines; turbo-generators; turbo-blowers and turbo-compressors; steam condensing plant; transformers; switchgear (heavy and medium); converting plant; dynamos and motors; motor control gear; traction equipment (electric and Diesel-electric); water turbines; electric furnaces; and welding equipment.

The Sectional Groups proposed by the Electrical Goods and Apparatus Export Committee are as follows:—Accessories; fans (ceiling and table); fractional-HP motors; fuses; heating, cooking and domestic appliances; instruments; insulators and insulations; meters; switchgear (light); and water heaters. The Sectional Groups under both Committees can be subdivided or added to as may prove necessary.

In addition to the foregoing arrangements the following manufacturers' associations are forming Export Goups to deal with their particular products:—The Accumulator Makers' Association; the Cable Makers' Association; the Electric Lamp Manufacturers' Association; the Electric Light Fittings Association; and the Radio Manufacturers' Association.

It is emphasised that membership of Sectional Groups is open to all British manufacturers of the goods dealt with by those Groups, and the Export Committees will be pleased to consider the formation of Groups for equipment not already covered. Interested parties should get into touch with the appropriate Export Committee at 36, Kingsway, W.C.2.

Dynamo-electric Amplifier for Power Control

THREE articles in the *General Electric Review* (America) are devoted to the theory, design and uses of the "Amplidyne" generator, a dynamo-electric amplifier for power control purposes which is said to represent the co-mingling of electronic and rotary engineering.

In physical structure the machine resembles the Winter-Eichberg motor, the Rosenberg generator and the Pestarini metadyne, characterised by a pair of short-circuited brushes at right-angles to the power brushes. But it is very different in function; amplification is the product of two stages, each of one-hundred-to-one, first from the control field to the short-circuited brushes and thence to the power brushes.

The flux which generates voltage in the short-circuit axis may be made only one-tenth as strong as the flux in the power axis. Therefore, the volt-amperes required to produce the control flux need be only one-hundredth as great as if the power field were excited directly from the control field. The control circuit may thus contain enough resistance in proportion to its reactance to ensure the desired quickness of response.

This new generator is fundamentally an armature-excited machine, in that the armature is essentially the source of main excitation as well as of main power output. Both circuits being on the same magnetic axis means that direct magnetic back coupling between the output and the control circuits may cause regeneration and oscillation. This tendency is neutralised by the compensating winding, the delicacy of this adjustment being indicated by the fact that the output volt-amperes may be more than ten-thousand times as great as the volt-amperes in the control circuit.

Regulation can therefore be based on variations of energy that are exceedingly small. A still greater ratio of amplification than is attainable by a single "Amplidyne" generator is possible by the introduction of a first stage of electron valves of the radio type. Applications include the control of machine tools, steel mill plant, the reeling of continuous strips of paper, &c., reel tension in wire drawing, and load division between large parallel-operating DC motors, &c.

STEAM FROM SPECIAL FUELS

Making Use of "Waste" Materials

By "Entropy"

THE utilisation of waste heat and special fuels is in many instances vital to the existence of an industry. This phase of engineering is, consequently, highly developed, often to such an extent that a "waste" fuel often ceases to be so regarded. Most branches of industry have occasion for waste-heat recovery or for the disposal of a special fuel, not necessarily a waste fuel; such applications are varied and are peculiar to each branch. There is, for instance, the application of the water-tube and fire-tube boilers to cement manufacture, to recuperate the heat in the gases discharged from the kilns, while in the production of non-ferrous metals a similar arrangement is used to recover the heat contained in the gases discharged from reverberatory and refining furnaces. Indeed, in most industries which involve the generation of heat for processing, the whole of such heat cannot be absorbed and some means is employed to recuperate the waste, usually by the installation of a waste-heat boiler or an air preheater.

Some processes, while not involving the discharge of combustion gases in a form which permits of heat recuperation in this way, produce gases which themselves are combustible and may therefore be used for firing steam producers or heating furnaces. For example, blast furnace and coke oven gases produced at steelworks can be burned without either elaborate burning equipment or complicated designs of combustion chamber. There are, in addition, a number of manufacturing processes where other combustible gases are produced and similarly utilised without difficulty.

Exhaust Gases from Diesels

Another example is afforded by the passing of the exhaust gases from a Diesel engine through a waste-heat boiler, usually of the thimble type, which serves the dual purpose of transferring the heat contained in the gases to boiler water and also of a silencer for the engine. In marine practice the auxiliary services are commonly run by steam thus generated. In the category of waste fuel, first thoughts are for colliery refuse, which can be burned on both mechanical grates and in pulverised form, but the equipment required and the accompanying combustion problems are by now well known.

Under the heading of special fuels come bagasse and husks, which can be burned satisfactorily on a commercial scale, usually by hand on stepped or inclined grates. These fuels often have a very high moisture content in the raw state, but suitably arranged arches to pre-dry the fuel before it reaches the combustion zone remove many possible combustion difficulties.

It is much more advantageous to use peat after a large part of the original moisture content has been removed by drying and the product has been pressed into briquettes. The latter can be burned on hand or mechanical grates without difficulty. Waste material for processing the briquettes, relatively dry, can also be burned on mechanical grates.

The use of pitch as a fuel is not widespread, but has proved satisfactory in several installations. Usually the pitch is mixed with creosote to form a fuel oil, but in a few instances it is now being burned in pulverised form. Its high volatile content enables it, when pulverised, to burn readily with a comparatively short flame, even though pulverisation may not be so fine as is usually necessary for the proper combustion of a normal bituminous coal. The structure and tacky nature of pitch introduce difficulties, but up to the present pulverisation to the necessary degree of fineness has been accomplished by a normal type of coal pulveriser, with slightly modified grinding elements.

Pulp is usually manufactured from wood, and irrespective of the process employed a certain amount of waste heat and other material is always available for disposal. The wood refuse is usually in the form of sawdust, bark and chips, and by virtue of the treatment it has received it has a high moisture content and the grate is, therefore, arranged with drying and burning zones. The refuse is introduced to the front part of the furnace which contains a comparatively flat grate for drying, after which it is in a suitable state for burning rapidly on the steeply inclined portion of the grate. Air for combustion is introduced under pressure to the underside of the grate and also to the air cavities in the combustion chamber walls, subsequently entering the furnace through ports in a manner which produces high combustion efficiency together with high rates of burning. For units burning refuse on a large scale with combustion equipment of this type, normal water-tube boiler constructions are used, with economisers and air-heaters if desired, and evaporations up to 60,000 lb. per hr. have been obtained for a single unit.

Dual-purpose Arrangements

The quantity of refuse varies from mill to mill and in some cases may be insufficient to justify the installation of boiler plant to burn refuse only. Such plants are generally designed for burning coal as the main fuel with auxiliary arrangements to deal with the available refuse. These units may be stoker-fired, which experience shows to be satisfactorily accomplished with a compartment-type stoker arranged with a front arch to form a drying zone, with an additional hopper suitably sealed as a means of introducing the refuse to the grate. Where pulverised coal is used the auxiliary furnace contains a grate for burning the refuse and the gases are admitted to the main furnace through an opening in the furnace wall. Alternatively if there is a consistent supply of wood to ensure the grate being covered at all times, the grate may be built in the main furnace.

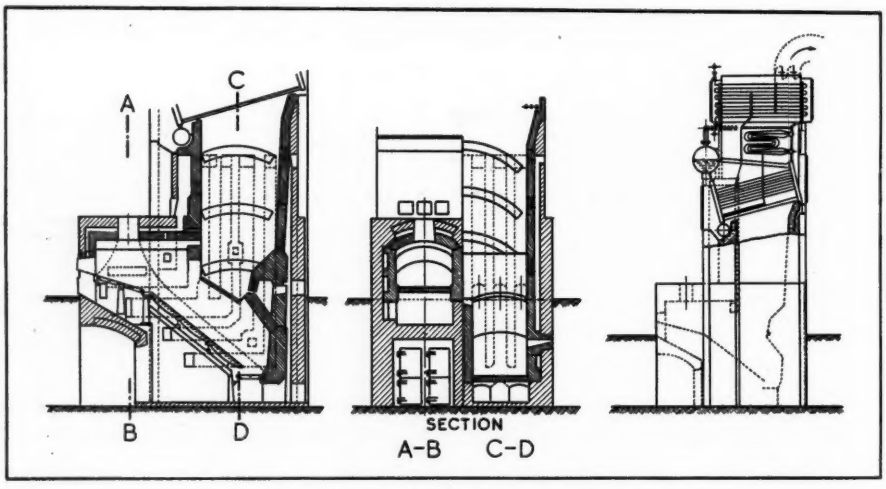


Fig. 1.—Boiler and furnace for sawmill refuse

Where pulp is produced by a chemical process there is, in addition to the wood refuse, a considerable quantity of waste liquor discharged from the digestors. These liquors contain combustible matter of appreciable heating value, but as the initial moisture content can be as high as 90 per cent., treatment is necessary to concentrate the liquor before combustion on a commercial basis is made possible. Concentration of the liquor is usually effected by a combination of multiple-effect evaporators and by heat extracted from the products of combustion, but however the concentration is accomplished the heat required is a large percentage of the heat available in the waste liquor, and the use of such liquor for combustion purposes is not therefore generally defined by thermal considerations alone.

The production of chemical pulp is effected by the sulphite, sulphate or soda processes, the choice of system being determined by the type of raw material and the quality of the

finished product. The processes are so named on account of the chemical constitution of the liquor in which the wood is digested and the cellulose extracted. Excluding the sulphite process, the residual liquors discharged from the digestors undergo chemical changes on incineration. The nature of these changes is such as to enable the major part of the chemicals used in the extraction of the cellulose to be recovered. It is primarily for the recovery of the chemicals that the waste liquors are burned as a fuel, but taking into account the quantity of steam that is raised by the modern type of recovery unit, it is difficult to visualise a more profitable application of waste fuel.

With the sulphate process the main constituents of the digesting liquor are sodium hydroxide and sodium sulphide. These chemicals are changed in the digesting operation and in the resulting waste or black liquor appear in complex form, together with the lignin extracted from the wood. By incineration of the black liquor, chemical changes take place which result in the production of sodium carbonate and sodium sulphide. The sodium carbonate is passed through a causticising plant to form sodium hydroxide which, together with sodium sulphide, forms the original digesting liquor. The cycle naturally entails chemical losses and to maintain the strength of the digesting liquor sodium sulphate is introduced into the furnace where it is reduced on incineration to sodium sulphide.

In the soda process the main constituent of the digesting liquor is sodium hydroxide and from the resulting black liquor sodium carbonate is produced on incineration. The sodium carbonate can be passed through a causticising plant to reproduce the original digesting liquor. Compensation for the chemical losses of the cycle is made at the causticising plant by the addition of sodium carbonate. For both the sulphate and soda processes the chemical reactions and the resulting chemical recovery are the deciding factors in the use of black liquor as a fuel.

Burning Black Liquor

The practice of burning black liquor to effect chemical recovery dates back about seventy years, but until a few years ago thermal recovery or steam production was not considered of much importance. It has been long established that black liquor, when dried to a powder, burns readily in a simple smelting furnace, and providing the combustion air is admitted carefully, the desired chemical changes take place automatically. In commercial practice, however, the burning of black liquor entails many difficulties, for instance the complete dehydration of the liquor must be carried out to within fine limits, for if slightly wet the powder cannot be handled easily, while if too much heat is applied the residue becomes tacky and again is difficult to handle. Secondly, the chemical nature of the liquor is such that ordinary refractories, if employed in furnace construction, are quickly attacked. Finally, there is always a certain amount of chemical ash entrained in the furnace gases which being of a very tacky nature fouls readily any surfaces with which it makes contact.

The development of the chemical recovery unit appears to have as its aim the production of a system which includes mechanical handling of the black liquor, assures continuous service and the utmost thermal recovery. The achievement of mechanical handling and reliability is quite a recent result, but for some considerable time attention has been given to obtaining improved thermal recovery. The early units discharged their gases direct from the furnace to the stack. Later disc evaporators were introduced into the circuit so as to dehydrate partially the black liquor by the furnace gases. More recently rotary kilns, boilers, superheaters and economisers have taken their place in the circuit.

In an effort to obtain greater reliability, furnaces of soapstone construction have long taken the place of ordinary refractories. More recently water-cooling systems have been introduced, although this step has been taken very cautiously owing to the disastrous effects of furnace-tube failures. The desire for mechanical handling has caused a complete change in the method of firing, as it has so far been found impossible to dry black liquor to a powder with the necessary degree of accuracy to ensure continuous working of mechanical feeding plant. Spraying the liquor into the furnace in the manner of a fuel oil was then adopted in an effort to obtain mechanical handling. The idea was not entirely new but as it imposed even more severe conditions on the furnace than other methods of firing, its general adoption had to await the introduction of a suitable furnace-wall construction.

Principle of Tomlinson Unit

This method of black liquor firing constitutes the design basis of modern recovery plant which is best exemplified by the Tomlinson and Wagner units. The Tomlinson recovery unit as required for the sulphate process has during recent years been installed almost exclusively in Scandinavia and America. The black liquor is sprayed across the path of the rising furnace gases on to the opposite furnace walls, where it remains to achieve dehydration of the liquor before combustion finally takes place on the furnace hearth.

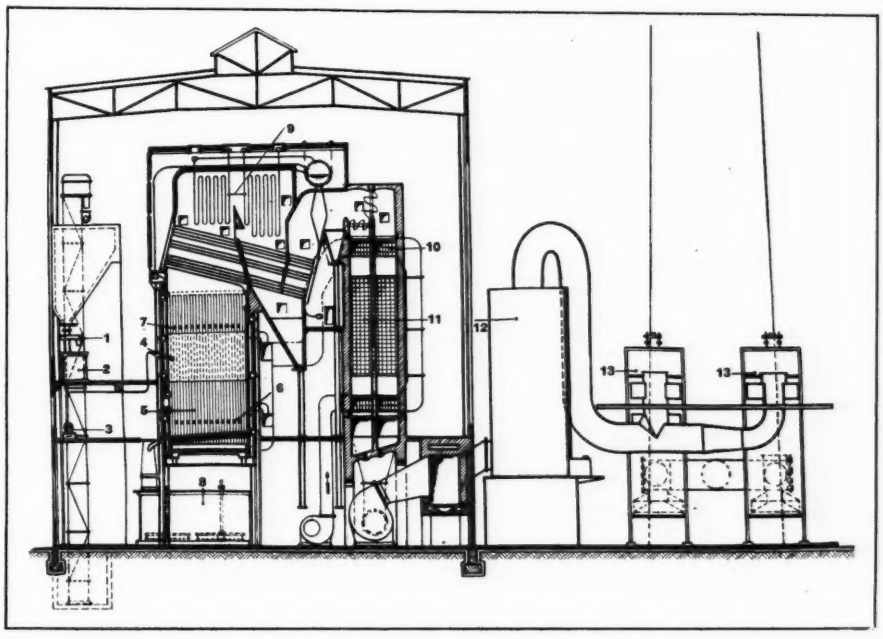


Fig. 2.—Tomlinson sulphate recovery unit.

The chemical losses of the plant are made up at the recovery unit by the addition of salt cake, which is conveyed to the storage bunker by means of an elevator and screw conveyor. The salt cake is fed mechanically by a feeder ((1) in fig. 2) into a tank (2) where is is mixed with black liquor delivered from the evaporator plant at a concentration of about 55 per cent. The black liquor is then pumped by a centrifugal pump (3) to the nozzle (4) situated in the front wall of the recovery furnace indicated by 5. This nozzle is designed to give a fairly coarse spray so that there is little tendency for the solid particles in the liquor to be carried away by the gases as they rise from the furnace hearth. At the same time the spray is fine enough to allow the maximum concentration of the liquor during its passage through the furnace gases. While the liquor is in suspension dehydration takes place to the extent which will allow the liquor to accumulate on the furnace walls on which it is deposited.

The resultant deposit is in the form of char and during the time it remains attached to the furnace walls further concentration takes place due to the heat radiated by the combustion gases. When dehydration is complete the dried char falls to the furnace hearth in a suitable state for burning, where it builds up to the level of the primary air ports (6), at which level it is maintained by the rate of combustion. The remainder of the air for combustion is admitted through the secondary air ports (7) which are arranged above the black liquor spray at an appreciable height from the furnace hearth.

Combustion on the hearth is very rapid and once the unit has been started up by means of either wood or oil, it is easily maintained. Smelt formed by combustion of the concentrated liquor percolates through the fuel bed and flows towards the tapping hole arranged in the front wall of the combustion chamber through which it discharges continuously

down a chute (8) into a dissolving tank. The gases rising from the hearth pass through the liquor spray before reaching the boiler tubes and other heating surfaces. The value of the chemicals used in the digesting liquor may be judged from the fact that it is found profitable to install both a washing tower and electrostatic precipitators (12 and 13) to recover the relatively small amount of chemical matter contained in the gases prior to their discharge to the stack.

The nature of the black liquor and the gases produced make it necessary for special features to be embodied in the construction of the furnace, boiler and other heating surfaces. Relatively wide gas passages are allowed while the superheater (9) is usually of the pendant type, both features being necessary on account of the solid matter entrained in the gases. The air-heater (10) and economiser (11) are again of special design in order to resist the effect of water with which the external surfaces are cleaned. The combustion chamber is formed by Bailey walls in which the usual cast-iron blocks are replaced by blocks specially designed to receive a facing of a neutral plastic refractory capable of resisting attack by the black liquor. The absence of a suitable combustion chamber construction has for a long time prevented the introduction of a mechanically operated recovery unit, but the adaptability of the Bailey furnace wall has enabled both the Tomlinson and the Wagner recovery units to be operated by automatic control.

Developing Sweden's Water-power

By S. Anker-Rasmussen

As few large falls in South Sweden have not now been harnessed, interest is centred in low-head rapids or small power sources which are remotely controlled from larger stations. Low-head plants have become common chiefly on account of the increased efficiency of new designs of Kaplan turbine with adjustable blades. An example is the recently built station at Vargon (22,000 kW), which operates with a head of 15 ft. only. It has no dam at the intake, which is on the same level as the turbines, and the whole plant is remotely controlled from Tröllhattan. Such stations are a paying investment despite the high cost due to the dimensions of the turbines and generators (26 ft. and 31 ft. in diameter). Another new plant now under construction near Tröllhattan will have a capacity of 90,000 kW.

Apart from such projects the greatest undeveloped possibilities are in the Norrland region in the north, where the Lule River has an estimated potentiality of two million HP. Here the 110,000-kW Porjus station is being extended by 25,000 kW. The turbine room, blasted out 160 ft. down into the rock and communicating with the ground level by shafts and lifts, is practically immune from damage by air-raids.

At the Harspranget falls a short distance south of Porjus a 250,000-kW hydro station is to be erected for the Royal Swedish Waterfalls Board. Although the mean flow of the Lule is less than most other Swedish rivers it could produce about 1,600 million kWh per annum at reasonable construction costs.

During the summer when drought may hamper the output of the South and Middle Swedish hydro-electric systems, large supplies of power will be required from the northern regions, and in the winter much energy, partly generated by steam in Central Sweden, will be transmitted in the opposite direction. The first trunk transmission throughout the country was a 200-mile line, operated at 220-kV, from Krangede via Ange to Horndal which was completed in 1936. This was extended to Stockholm, a further 88 miles, and another 220-kV line was run from Horndal via Orebro to Nassjo (200 miles), at which it is linked up with a 132-kV line to Malmo (163 miles). This trunk transmission line has been provided by a combine of power companies and industrial firms.

A second trunk line is expected to be completed this summer by the Waterfalls Board, one section, running from Porjus via Bredaker to Stadsforsen (300 miles), transmits power at 132 kV. A second section, from Stadsforsen to Vasteras (256 miles) is designed for 220 kV. An additional 132-kV line is being constructed at the northern end to connect the Stadsforsen plant with a large private station at Hissmofors. The municipality of Stockholm also plans to transmit power from a new 100,000 kW plant at Jarpstrommen, 325 miles away. A more comprehensive scheme is now contemplated by the Waterfalls Board for transmitting 300,000 kW at 380 kV on a single line from the Lule River to Middle Sweden.

At the end of 1938 the capacity of hydro-electric generating plant was 1,700,000 kW, of which 31 per cent. was in the Norrland region, 36 per cent. elsewhere in the North, and the rest in South and Central Sweden. The figure was officially expected to reach 2,200,000 kW by the end of 1945 (40 per cent. in the Norrland region), but in consequence of the present war the programme is being speeded up and the total capacity is now expected to exceed 2,500,000. New water storage schemes will, in a couple of years, provide stored-up water-power equivalent to 20 per cent. of the power stations' annual production. Other large new stations will be one of 70,000 kW at Stadsforsen (River Indal) and 85,000 kW at Torpshammer (River Giman), while the Tröllhattan station is to be extended by 67,000 kW and the Kattstrupeforsen (River Indal) station by 35,000 kW, all by the Waterfalls Board.

For the current year consumption should exceed 10,000 million kWh (twice that in 1933). The ability of water-power to compete with imported fuel has been much improved as a result of the present coal prices, and well-regulated hydro stations can also hold their own even in meeting short peak demands. During the past decade the amount of steam-generated energy has been decreased to 9 per cent. of the total. The present annual full importation is about 9 million tons most of which is used for heating. This cannot be replaced entirely by hydro-electricity, as to do so would require much more than the possible maximum of 32,000 million kWh per annum officially computed as the country's total water-power resources. It has, however, been estimated that the consumption by 1945 will have risen to 13,000 million kWh.

Stator of alternator for the Vargon power station

Before last August any person could construct power transmission lines, subject to certain precautionary measures and building regulations. Under legislation then introduced the Government decides if projects are necessary to the general electrification scheme and issues concessions accordingly. Owners or operators of transmission lines are obliged to adjust electricity tariffs according to consumers' justified claims, subject to the right of appeal by either party to an over-riding authority.

Unit-construction Trolley-bus

As a result of two years' experience with an experimental trolley-bus of novel design, London Transport has put twenty-five more into service. In this type the body side-pillars are rigidly connected to the underframing, for which purpose cross members and outriggers are arranged to coincide with the standard-body pillar positions. Conventional floor bearers are eliminated. Welding has been reduced to a minimum. The under-frame consists of a light pressed-steel frame of deep section of little more than one-half the usual thickness. The flanged foot of the body bulkhead coincides with a similar flange on the underframe cross member to which it is riveted. The rear of the frame terminates in a deep cross-member extending the full width of the body which forms a step riser and also a bulkhead to which corner and door pillars are attached. The under-frame can be employed with bodies built by different manufacturers incorporating varying pillar sections. Advantages claimed for this form of construction, in addition to overcoming the difficulties of holding down the body-chassis, are a slight saving in weight and, probably, longer life and cheaper maintenance. A disadvantage is that its use is limited to large standardised contracts as it is not readily modified to operators' particular requirements.

NEW BOOKS

Electric Clocks. Superhet Circuits. The Use of Vectors

Electrical Timekeeping. By F. HOPE-JONES, M.I.E.E., F.R.A.S., (Pp. xix+255; figs 131). N. A. G. Press, Ltd., 26, Old Street, London, E.C.1. Price 10s.

This book is a good one. In a foreword the Astronomer Royal remarks that it is nearly one-hundred years since the first attempts to apply "galvanism" to horology were made. The author's aptness of descriptive explanation shows how the gropings of the early experimenters have led onwards to the remarkable precision which is the accepted standard in modern observatories. He has himself contributed in no small measure to the ultimate success of the electric clock.

The whole story, from the first experiments of Bain and Wheatstone to the final success of the Shortt "free pendulum," is told with impartiality. It shows how the first attempts failed because of defects in principle and reveals the surprising way in which these very defects were not realised by successive inventors.

The chapter on synchronisation by the use of the phenomenon known as "circular error" explains a delightfully ingenious scheme which will attract the scientifically inclined, and although at first sight the matter seems complex, it is not really so.

The free style in which the whole of the text is written, and the clear illustrations and good plates, raise the book beyond the level of a mere textbook. A glossary of terms, both electrical and horological, is so designed as to be of service to every kind of reader.—T. R. R.

The Superheterodyne Receiver. By ALFRED T. WITTS. Fourth edition. Pp. 189; figs. 114. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, W.C.2. Price 4s.

First published in 1934 and now in its fourth edition this book was about the first to deal with the specialised subject of superheterodyne radio receivers from the British angle, and it has become almost a standard work on the subject.

The new edition has been extensively revised, and the chapter on frequency-changers has been rewritten in view of recent developments in this field. All the latest types of frequency-changer valves are fully described, and two-valve frequency-changer circuits are also dealt with. This is one of the few books which is up-to-date regarding superheterodyne refinements, such as automatic volume control, automatic tuning correction (or, more commonly, automatic frequency control), and so on. Press-button tuning, however, is perhaps rather casually dismissed in two pages, although it is rarely fitted to sets other than superheterodynes.

In the chapter on maintenance, the use of the cathode-ray oscilloscope for the alignment of modern high-quality superheterodynes would seem to deserve at least a mention. Generally speaking, however, the book is packed with useful information, including very full component-by-component descriptions of nearly a dozen fairly modern commercial receivers, and there is a whole chapter on the television superheterodyne.—W. E. M.

Elementary Vectors for Electrical Engineers. By G. W. Stubbings. Pp. 110; figs. 73. Sir Isaac Pitman & Sons, Ltd.

This little work is useful, original, stimulating, and well-written. Rather more than the first half deals with the graphical, and the remainder with the algebraical, method of representing vector quantities. No previous knowledge of vectors is assumed, and the mathematics is throughout of the simplest. The opening chapter begins on well-worn lines by showing how a quantity which varies sinusoidally with time may be represented by a line in which magnitude and direction are defined; but already on page 13 we meet a touch of originality in the strikingly simple way of proving why the effective value of such a quantity is $\sqrt{2}$ times the peak value

In Chapter II again the author has found a swift and happy way of leading up to the circle diagram for an induction motor. In the third chapter appreciation is shown of the difficulty most students have in deciding whether a quantity in polyphase work should be plus or minus; the approach via DC problems may or may not be the best, but most authors ignore this difficulty altogether. Balanced and unbalanced three-phase circuits are treated with thoroughness and clarity.

The only fault to be found with the graphical part of the book, if it be a fault, is a conciseness which demands mental jumps of which most students are incapable. If the author had introduced here and there those few extra words of explanation which every lecturer finds necessary when teaching students, the book would not have become much larger, and it would be easier going for the novice.

Not so with the symbolical method of vector representation. Here the reader benefits from some of the doubts and difficulties which an active mind must experience when first introduced to the subject. And in discussing why the use of imaginary quantities is justified the author shows a proper appreciation of the points of view both of the pure mathematician and the practical engineer. No better way could be found to enable the student to understand exactly what the complex quantities with which he operates mean. But his notation is to be deplored. Like nearly everyone else who writes books, Mr. Stubbings has his own way of denoting a vector quantity. He uses square brackets. But why not follow the B.S.I.? The letter "a" for an operator which turns a vector through 120 degrees is also not a happy choice, though it is often found in American books. This letter is too liable to be needed in the same formula with some other meaning; λ is preferable and should be standardised.—R. O. K.

Guide to Technical Literature: Introductory Chapters and Engineering. By A. D. ROBERTS. Pp. 279. Grafton & Co., 51, Great Russell Street, London, W.C.1. Price 15s.

Librarians in general and engineers, technologists, research workers and librarians of technical institutes in particular will welcome this concise and highly creditable book. The introductory chapters of the guide comprise the first 47 pages and give an excellent bibliography and history of technology in general. The next 200 pages are devoted to books on every branch of engineering. An exhaustive name and subject index completes the volume.

The value of the bibliography to the engineer is enhanced by the copious and well-informed notes which Mr. Roberts has added where necessary. The information so given will not be readily found available elsewhere in any one volume. The bibliography contains foreign books in addition to works in English.

Electrical engineers will read chapter eleven with interest. It is one of the best bibliographies of electrical engineering that we have seen. It contains some seventy headings and if some of the low-priced books have been omitted and the heading "Dynamos" does not appear either in the text or in the index, these are omissions that throw into relief the great virtues of the book. Not only will the guide save time for the busy man, but its value to him will repay manyfold its moderate cost.—W. G. B.

Shorter Notices

"Principles of Industrial Organisation." By Dexter S. Kimball and Dexter S. Kimball, Jnr. Pp. 478; figs. and plates, 66. Price 26s. "Practical Electrical Wiring: Residential, Farm and Industrial." By H. P. Richter. Pp. 503; figs. 457. Price 20s. McGraw-Hill Publishing Co., Ltd., Aldwych House, London, W.C.2.

"Industrial Plastics." By Herbert R. Simonds. Pp. 370; figs. 130. Price 22s. 6d. "First Year Engineering Science: Mechanical and Electrical." By G. W. Bird. Revised by B. J. Tams. Pp. 136; figs. 120. Price 5s. Sir Isaac Pitman & Sons, Ltd.

"Household Physics." By Walter G. Whitman. Third edition. Pp. 436; figs. 420. Chapman & Hall, Ltd., 11, Henrietta Street, London, W.C.2. Price 18s. While the general plan of this edition is similar to that of previous ones, important changes will be found in the sections on electrical devices, illumination and radio. Six new chapters added deal among other things with air-conditioning, and electricity in everyday life. The book is written in a popular style with copious illustrations.

"Radio Upkeep and Repairs for Amateurs." By A. T. Witts. (Fourth Edition.) Pp. 215; figs. 131. Sir Isaac Pitman & Sons, Ltd. Price 6s.—This handbook is described as a practical guide to fault-clearing and set maintenance for the average non-technical owner. Some of the earlier sections have been revised and enlarged; three chapters have been deleted and a ninth added with the object of indicating how the quality of reproduction of existing receivers might be improved, with hints on operation and the limitations of circuits and components.

"Fundamental Processes of Electrical Discharge in Gases." by Leonard B. Loeb. Pp. 717; figs. 297. Chapman & Hall, Ltd. Price 42s.

INDUSTRIAL LIGHTING

Conference on Wartime Problems

A SPECIAL conference on wartime industrial lighting was held on Wednesday at the E.L.M.A. Lighting Service Bureau, delegates being received by Mr. C. H. Cox, chairman of the E.L.M.A. Council. The proceedings opened with a lecture on "Lighting for War-time Production" by Mr. H. Lingard, manager of the Lighting Service Bureau, who declared that investigations had shown that in no field of lighting development had improvement been so needed as in the case of industrial lighting. To-day, the subject represented the key to increased production. Everything that hampered production must be swept aside, and every contribution that science and research could offer must be immediately utilised.

There was no need to emphasise the effect of the black-out on working conditions in factories. Under continuous working conditions the average factory depended upon artificial lighting for about 60 per cent. of the working day. Unless immediate steps were taken to improve the lighting conditions production would suffer just as much during the hours of darkness as it did with total obscuration during the daylight hours. Fortunately, however, good lighting remained one of the easily obtainable services. There was no scarcity of lamps and lighting equipment.

Good factory lighting increased production, simply because it enabled people to see quickly and clearly. The industrialist had been accustomed to think of the workers as "hands": the lighting specialist, however, thought of them chiefly as eyes. While it might be the "hand" which did the job, its direction by the brain was entirely dependent on the accuracy and speed of the signal received from the eye.

In all problems of re-lighting the question naturally arose as to the degree of illumination which should be provided for each process or task. Artificial light, unlike daylight, had to be paid for; if it cost nothing, very high levels of illumination could be employed in factories. As it was, a balance must be struck between the severity of the task on the eye of the operative and the cost of providing enough light to enable him to see quickly and accurately. Every improvement in lamp efficiency, therefore, represented a reduction in the cost of light, presenting an opportunity of improving industrial lighting conditions at a cost by no means commensurate with the improvement. Recommended foot-candles for a wide variety of industrial processes were published, based on current practice in modern factories.

Output and Efficiency

Production tests in which the lighting was varied under otherwise fixed conditions were of great interest, and a very thorough investigation was carried out some time ago by a Government Committee into the relationship existing between illumination and accuracy of operatives on fine detail work (typesetting by hand). These tests furnished important and conclusive data. Daylight conditions were assumed to provide the best working conditions, and it was found that the value of artificial light required to produce similar efficiency of operation was of the order of 20 ft.-c. Reductions from this intensity resulted in large decreases in output. At 7 ft.-c. the output had dropped by 10 per cent., while the percentage of errors increased. When the lighting intensity was still further reduced to 2 ft.-c. output was down by 25 per cent., while errors had more than doubled.

It was also shown that three men working under an illumination of 20 ft.-c. could do as much work as four men with only 2 ft.-c. Interpreting this in terms of the payroll, the total saving effected by increasing from 2 to 20 ft.-c. was sufficient to pay for the extra lighting twenty times over. Of still greater importance was the increased output available from a given number of operatives, resulting in the enlargement of the potential productive capacity of the works. The above investigation had been supported by many other tests of an independent kind in a variety of industries, and in every case the expenditure involved in installing and maintaining an efficient lighting system was amply repaid in greater output of better quality work. In view of this it was difficult to understand why good industrial lighting was not adopted more universally.

"Recent Lamp Developments and Demonstrations of Lighting Levels" was the title of the lecture given by Mr. W. J. Jones, deputy director of E.L.M.A., at the afternoon session. He said that even under wartime conditions the economics of lighting should still be studied. Electricity costs had risen in some cases by as much as 40 per cent. and hours of work under artificial light had greatly increased, so that lamp efficiency became a dominant factor in keeping down lighting costs. It was therefore more than ever necessary to use lamps of the highest efficiency and suitability. For example, assuming a pre-war charge of 1d. per kWh and 800 hours' use per annum, lighting 100 sq. ft. by a 200-W lamp cost 17s. 9d. In wartime assuming 1½d. per kWh and 4,000 hours' use per annum, the cost of lighting a similar area became £5 5s. 4d. If a cheaper lamp 10 per cent. less efficient were used, the extra cost of lighting the 100 sq. ft. in peacetime would be 1s. and in wartime 11s. 8d.

The efficiency of electric lamps had been greatly increased during the past fifteen years. Manufacturing processes and technique had been responsible for a steady improvement in the higher wattages, while the coiled-coil filament lamp gave up to 20 per cent. more light than the single coil filament lamp of the same wattage. Equally important to the works engineer was the improvement in uniformity. Mercury vapour and sodium discharge lamps, giving three to five times the light output of filament lamps of the same wattage, had been adopted to such an extent for lighting large areas that we led the world in this respect. By the use of fluorescent coatings inside the bulb of mercury lamps a light source had been developed which, while giving the high efficiency of the ordinary discharge lamp, combined with it satisfactory colour rendering. The new 5-ft. fluorescent tubular lamp had many advantages. From investigations made it would appear that the majority of important factories were working with permanently blacked-out windows. In these cases a general illumination of 15 to 25 ft.-c. of artificial lighting was common, with supplementary lighting for special processes. The effect of movement was important when considering the lighting of conveyor belts. Gauge rooms where the illumination might be 40 to 50 ft.-c., and drawing offices where 30 ft.-c. general illumination was becoming quite commonplace, were locations where the new fluorescent lamp could be used with advantage because of the relative ease of temperature control.

Black-out Arrangements

Mr. A. D. S. Atkinson, speaking on "Industrial Lighting Problems of the Black-out," said that good lighting could not be employed after dark unless factory black-out arrangements were first-class. The methods of obscuration effective a few months ago might not now be suitable. Many factories were working longer hours and there was the question of ventilation to consider. New factories were being built with no windows in order to obtain maximum protection from splinters and incendiary bombs, and it had been reported that no complaints were received about permanent artificial lighting provided this was of the order of 20 ft.-c. On the other hand, most existing factories had windows and it was considered desirable to use them, particularly in summer.

There was a choice of methods of blacking out glazed surfaces. Complementary colour lighting could be used where the yellow light at night and the blue light during the day were no disadvantage, and the 10 to 15 per cent. of normal daylight admitted might be sufficient to enable the factory to work without artificial light in the daytime. It could not be used where the process emitted light (as in arc welding) unless this process itself was completely screened by other means. Whatever system was employed some form of ventilation had to be provided.

For exterior lighting the police, with the authority of the Ministry of Home Security, might sanction the use of certain levels of exterior lighting for special purposes. The various maximum intensities permitted might be very roughly classified as: 0.002 ft.-c. for movement; 0.02 ft.-c. for rough handling; and 0.2 ft.-c. for certain specified process work. B.S. Specifications Nos. A.R.P. 16, 20 and 21 specified suitable fittings for producing these three levels of illumination, and the conditions of use.

Correspondence

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Gas-Electricity "Truce"

THE letter by Lieut.-Colonel S. E. Monkhouse in your issue of May 17th is refreshing as a rejoinder to the leading articles which recently you have thought it wise to print.

As a member of the National Joint Gas and Electricity Committee I hold and have voiced somewhat similar views to those expressed by Colonel Monkhouse, for to my mind this is the time to consider the interests of the Empire and not those of any particular industry. The country is dependent on both electricity and gas and each industry should be complementary to the other, while so far as I can see any publicity—and I think publicity necessary—should be framed as an endeavour to make the best use of our fuel and transport resources and to prevent waste.

Unless I am greatly mistaken, what I indicate above accords with the views of those members of the Joint Committee who represent the gas industry.

A. J. FIPPARD,
Chairman.
Electric Supply Corporation, Ltd.

London, E.C.2, *May 20th.*

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

New Ministers.—Further appointments to the Ministry were announced last week. Mr. J. Chuter Ede becomes Parliamentary Secretary to the Board of Education, and in consequence is relinquishing the position of chairman of the London and Home Counties J.E.A. Mr. W. S. Morrison continues as Postmaster-General. Board of Trade appointments include the following:—Parliamentary Secretary, Major Gwilym Lloyd George; Secretary for Mines, Mr. David Grenfell; Secretary, Department of Overseas Trade, Mr. Harcourt Johnstone; Secretary for Petroleum, Mr. Geoffrey Lloyd. The Parliamentary Secretary to the Ministry of Supply is Mr. Harold Macmillan. We reproduce with this note the portraits of the principal Ministers

Sir John Reith (Minister of Transport), Mr. W. S. Morrison (Postmaster-General), Sir Andrew Duncan (President of the Board of Trade), and Mr. Herbert Morrison (Minister of Supply)

whose departments are related to the electrical and allied industries.

Mr. H. J. Allcock, M.Sc., M.I.E.E., of Callender's Cable and Construction Co., Ltd., has been nominated for the chairmanship of the Transmission Section of the I.E.E. for the 1940-41 session.

I.E.E. Awards.—The Council of the Institution of Electrical Engineers has made the following award of premiums for papers read during the 1939-40 session, or accepted for publication:—Institution: Mr. G. F. Sinclair. Ayrton: Messrs. G. T. Winch and A. M. Midgley. Fahie: Mr. H. H. Harrison, M.Eng. John Hopkinson: Mr. W. D. Horsley. Kelvin: Mr. T. L. Eckersley, B.Sc., Ph.D., F.R.S. Paris Exhibition (1881): Messrs. B. P. Dudding, M.B.E., Ph.D., and W. J. Jennett, B.Sc.(Eng.). Overseas: Mr. J. R. Brookman, M.E., and Messrs. G. Babat and M. Losinsky. Extra: Mr. H. L. Thomas, B.Sc.(Eng.), Messrs. H. E. Cox and L. Drucquer, Mr. J. W. Gibson, M.Eng., Prof. Alfred O'Rahilly, M.A., B.Sc., Ph.D., D.Litt., Prof. J. J. Rudra, M.A., B.Sc., Ph.D., and Mr. H. A. Sieveking, M.Sc.

Wireless Section: Mr. T. Walmsley, Ph.D., B.Sc. (Duddell Premium), Messrs. W. West, B.Sc., and D. McMillan, B.Sc., Messrs. J. S. McPetrie, D.Sc., Ph.D., J. A. Saxton, B.Sc., Miss A. C. Stickland, R. L. Smith-Rose, D.Sc., Ph.D., and H. G. Hopkins, Ph.D., B.Sc. Meter and Instrument Section: Mr. F. O. Morrell, B.Sc., and the late Mr. G. R. Oman, B.Sc., Messrs. D. M. Myers, D.Sc. (Eng.), and W. K. Clothier, B.Sc., B.E. Transmission Section: Messrs. E. Fawssett, H. W. Grimmitt, G. F. Shotter and H. G. Taylor, M.Sc. (Eng.) (Sebastian de Ferranti Premium), and Mr. W. L. May.

The awards for papers read before the Students' Sections will be announced later.

Mr. A. Page, B.Sc., M.I.E.E., A.M.I.Mech.E., has severed his active connection with Landis & Gyr, Ltd., of North Acton, London, W.3, with whom he has been engaged as technical and sales assistant for the last ten years. His address is "Briarside," Gascoigne Lane, Ropley, Hants.

It was reported to Kirkcudbrightshire County Council at its last meeting that the Electricity Committee had approved of **Mr. G. V. Vaughan,** county electrical engineer, who had been a member of the Civil Air Guard, accepting a commission in the Royal Air Force.

Mr. W. J. Picken, of Marconi's Wireless Telegraph Co., Ltd., has been nominated for the chairmanship of the Wireless Section of the Institution of Electrical Engineers for the 1940-41 session.

Mr. T. Hamo Thorneycroft has been appointed a director of the Clyde Valley Electrical Power Co. and of the subsidiary companies, the Strathclyde Electricity Supply Co., Ltd., and the Clyde Valley Accessories, Ltd.

The Micanite Sports and Social Club, the members of which are employees of the Micanite & Insulators Co., Ltd., have a new sports ground at The Rolls, Highams Park, E.4, and a cricket match between the works and the staff took place in brilliant weather on May 4th. Major S. M. Mohr, president of the club, was present with Mrs. Mohr, together with a large gathering of members and their friends. The ground, amid beautiful surroundings, has facilities for cricket, tennis, and football, and the beginning of the afternoon's proceedings was marked by the formal opening of the new pavilion by Mrs. Mohr. The building is of cedar wood and asbestos construction and is fitted with electric light, radio, and electric heating and cooking, the cost having been borne by the company.

In our last issue we published particulars of the career of **Mr. J. B. Lees,** M.I.E.E., who has been appointed borough electrical engineer of Sale in succession to Mr. C. J. Wood, who is retiring in July. We now reproduce a recent portrait of Mr. Lees.

Mr. J. B. Lees

We learn from *Contact*, the staff journal of Central London Electricity, Ltd., that **Mr. H. T. Young,** M.I.E.E., chairman and governing director of Troughton & Young, has been elected a director of London Associated Electricity Undertakings, Ltd., and Central London Electricity, Ltd.

Mr. S. Hepworth, director of Hepworth & England, Ltd., electrical engineers, of Batley, has been elected chairman of the West Yorkshire branch of the Electrical Contractors' Association. Mr. Hepworth is also a member of the District Joint Industrial Council.

Mr. T. E. Thomas, general manager (operation), London Passenger Transport Board, has consented to continue in the office of president of the Institute of Transport for the year commencing October 1st.

Southport Corporation Transport Committee has appointed **Mr. R. Hawkins,** rolling stock superintendent, Merthyr Corporation, as assistant engineer and manager at a salary of £360 a year.

Mr. G. E. Carter, charge engineer with the Leyton Corporation Electricity Department, is to retire at the end of the current month after forty years' service.

Mr. W. V. S. Scorer, manager of the Bourne office of the Mid-Lincolnshire Electric Supply Co., Ltd., since February, 1937, is going to Grantham in June as assistant to the company's general manager. His position at Bourne is being taken by **Mr. D. E. Castley,** the Grantham district engineer. **Mr. S. W. Appleton,** who has been with the company since 1932 and has been assistant engineer at Bourne, has been promoted district engineer at Lincoln and expects to take up his new post in June.

Obituary

Mr. Herbert John Ward, whose recent death is announced from Farningham, Kent, at the age of seventy, was from 1901 until 1937 on the board of J. & E. Hall, Ltd. He was appointed chairman in 1921, and held this office until his retirement in 1937, through ill-health. He was a member of the Council of the British Engineers' Association, of which he was president during the period 1925 to 1928.

Mr. W. H. Massey.—We regret to record the death of Mr. William Henry Massey, M.V.O., which occurred on May 13th at the age of ninety. Mr. Massey was for more than forty years consulting engineer to the King, and held the appointment of Mechanical and Electric Light Engineer in the Master of the Household's Department until he went into retirement approximately twenty years ago.

Mr. W. H. Massey

Born at La Seyne, near Toulon, Mr. Massey was educated at Leeds Grammar School, and served his apprenticeship with a firm of millwrights in Leeds. After a period with the Russian Steam Navigation Co. he became outdoor manager with John Penn and Sons, and was one of four civilian experts who took part in the sea trials of the *Devastation*, the first sea-going battleship in the British Navy to depend solely on steam for propulsion.

In 1875 he went to Germany and on returning to this country was summoned to Windsor in 1878 to remedy defects in the boiler of a steam roller designed by the Prince Consort. Later he joined John Fowler & Co. and was engaged on colliery work in South Wales and elsewhere. In 1881 he turned his attention to electric lighting and became manager of the company which lighted the Crystal Palace by electricity in 1882.

In the same year electric lighting was installed at Windsor, and a little later orders were given for electric lighting at Buckingham Palace, including the ballroom and other State apartments. Mr. Massey went into practice as a consulting engineer in Westminster and received the appointment of Mechanical and Electric Light Engineer under the Board of Green Cloth, a position which he held for more than forty years. He was formerly a director of the Brush Electrical Engineering Co., Ltd., and was a Member of the Institutions of Civil and Electrical Engineers.

Mr. E. S. Barralet.—Many readers will learn with regret of the death, on May 17th, of Mr. Edgar Stuart Barralet. During his long career with Pinchin, Johnson & Co., Ltd., of which he became a director, he made a large number of electrical friends. He was also a director of Bakelite, Ltd. Mr. Barralet was president of the Batti-Wallahs' Society in 1922 and 1923, and of the Electrical Industries Benevolent Association in 1925.

E.I.B.A. ANNUAL MEETING

Serious Effect of War Conditions

THE annual meeting of the Electrical Industries Benevolent Association, which was held on May 17th, took place this year at the Association's headquarters, 6, Southampton Place, London, W.C.1, in view of the Association's decision not to hold a luncheon, which has been the usual practice in previous years. The meeting was presided over by Mr. P. V. Hunter, who, as an emergency measure, has accepted the office of president of the Association for a second year.

In presenting the annual report to the Council, Mr. Hunter laid particular stress on the increasing calls upon the funds of the Association since the outbreak of the war. He mentioned that the first four months of the war had cost the Association £2,300, and it was only due to the fact that it was £1,300 ahead of the previous year at the end of August that it had finished up the year with only a decrease of £1,000 in its income.

This was particularly serious when the effect of the current year was anticipated, with its expected twelve months of war conditions and the war cases which had come along to increase still more the number of deserving people applying for help. Mr. Hunter also emphasised that the work which had been done in giving non-financial help had been even more thorough than ever before, as this was often much more valuable than financial help, and without it money grants were often of limited service to beneficiaries.

Importance of Social Service

He said he had been shocked by many charitably disposed persons who did not appreciate this, and in consequence thought that the expenditure of the Association, apart from its actual money grants, should be decreased. This would be easy if the E.I.B.A. were a mere dole-granting institution, which it was not. Its primary object was to give social service to those in difficulties. Very little of its office expenses were incurred in mere administration; they mainly applied to helping socially those in need of encouragement, guidance, comfort, and advice.

Many cases were in need of a great deal of attention in this way, with little cash assistance, or the Association might be able to obtain all necessary cash by grants from other bodies or by Government pensions, and such cases had an adverse effect on the ratio of general expenses to cash relief. He said he would be very sorry to see a reduction in the Association's social work, on which the industry had good cause to congratulate itself.

It followed from the decrease of revenue and the increase in its work that unless the Association got substantially greater help it would not balance its budget in 1940. It had been suggested that the Association should sell its investments, but they did not consider it advisable to do this for the present, but rather that they should conserve their resources against the possibly much more disturbed conditions which might lie around the corner. The Association had, therefore, decided to launch a special emergency appeal.

Sir Archibald Page, in seconding the motion for the adoption of the report, paid tribute to the work during the past year of Mr. H. S. Fothergill, the secretary, and the staff of the Association.

Mr. J. N. Stephens, chairman of the Court, in moving the election of members of the Council, said that all those who had served on the Council in the past year, with two exceptions, had agreed to serve again. The Association was endeavouring to raise funds through trade associations, apart from the usual subscriptions, and he proposed that two or three vacancies should be left on the Council for representatives of these associations. This proposal and the re-election of members of the Council were approved, and Price, Waterhouse & Co. were re-elected as honorary auditors.

Annual Report

The report shows that in the early part of 1939 there was promise of improving the position in which the Association's disbursements were rising at a greater rate than its income. The outbreak of war radically altered the situation, cutting off sources of income (social functions and individual and company subscriptions), and increasing the number of appeals from those affected by the dislocation of war.

It is emphasised that the social service performed by the E.I.B.A. is often of greater value than mere financial assistance. Such service takes the form of legal, educational, occupational, medical and similar help. In many ways the Association acts *in loco parentis* to a very large family, and the cost of all this work is not included in the item "Grants, Pensions and Allowances" which covers only the cash portion of the help given in each case.

Nearly all the 189 cases dealt with during the year involved money payments totalling £7,945. In 80 of them the weekly allowance had been continuous during the whole year, and 15 of these cases have been helped without a break during the last ten years. The figure of 189 is an increase of 31 upon the number of cases in 1938, and, taking into account dependants of the applicants, help was given to 402 men, women and children, of whom 66 were widows in need through various strokes of ill-fortune. The report quotes a number of typical cases in which the Association was able to relieve the hard lot of deserving people.

It is stressed that not one application has been dealt with by "rule of thumb." Each case has had individual consideration in relation to special needs and personal characteristics. Over 900 committee agenda items have been considered in the course of the year's work. Tribute is paid to the friendly co-operation of other benevolent funds in the industry and to the many volunteer workers.

Association's Accounts

The accounts for the year show a charitable income, after allowing for reserves, of £11,213, a decrease of £999 as compared with the previous year's figure, although at the end of August there was a substantial favourable balance. The addition of £2,586 from investments gave a disposable figure of £13,799. On the expenditure side grants, pensions and allowances are shown at £7,945, expenses (including salaries and wages, office and general expenses, and publicity) at £3,438 and depreciation of furniture and equipment at £43, leaving a credit balance of £2,373. Investments (at cost) are given as £72,367. It is noted that the general expenditure has decreased by £430.

The report contains a list of substantial gifts by companies and individuals received during the year, and mentions that the total donation by the Electrical Wholesalers' Federation amounted to £500. The Electrical Contractors' Association is inaugurating a similar scheme to that of the E.W.F. and other associations are giving the matter consideration.

In appealing for additional support the Association shows that only about 6 per cent. of the non-manual workers in the industry are members of the Association; that not all the firms in the industry subscribe to the funds, and fewer subscribe generously; that E.I.B.A. collections should be taken at all electrical gatherings; that deeds of covenant allow income tax to be recovered by the Association; and that companies might send out an appeal with their dividend warrants, as one of the largest firms in the industry has done for several years.

After a reference to the abandoned golf competition, which, nevertheless, brought in £449, the report concludes with thanks to the president and all helpers and with an appeal for greater financial help in this time of grave necessity.

New Power Plant in Japan

MORE progress was made in the production of heavy electrical machinery in Japan during 1939 than in any previous year. Fourteen steam turbo-generators aggregating 532,925 kVA, and 24 hydraulic sets aggregating 504,750 kVA were completed by the three large manufacturing concerns, which this year are to deliver 78 generators each of 10,000 kVA or over which will have an aggregate capacity of 2,267,000 kVA.

The outstanding machine put into service last year was a 1,800-RPM three-cylinder tandem vertical steam turbine of the impulse type driving a 93,750-kVA (0.8 power factor) 13.2-kV alternator. It was installed in the power station of the Nippon Electric Power Generation and Transmission Co. at Amagasake, near Osaka, the ultimate capacity of which is 300,000 kW, made up of four 75,000-kW machines—said to be the largest in the Orient.

The initial set has been in use since 1938. The generator may be uncoupled from the turbine for operation as a 60,000-kVA synchronous condenser. Steam conditions are 540 lb. per sq. in. and 800 deg. F., with a vacuum of 28.9 in.

Two 62,500-kVA, 1,800-RPM generators were built for the Central Japan Joint Steam Power Co. and the Nippon Electric Co. Two steam sets of 37,500 kVA have the largest output at 3,600 RPM in Japan. Other sets installed for this speed are rated at 31,250 kVA, 15,625 kVA and 12,500 kVA. One of the last-named size is intended to feed a single-phase electric furnace through a Scott-connected transformer.

At the Senju water-power station of the Railways Ministry (one of the largest hydro-electric projects in the Far East) three Francis turbines driving 31,000-kVA generators were put into operation. This station supplies power to electrified railways in and around Tokyo by means of high-voltage lines over mountain ranges. The head is only 175 ft., entailing a turbine speed of 150 RPM and the use of alternators measuring 39 ft. in outer diameter and overall height and weighing 560 tons.

Eighteen other hydraulic sets with individual capacities ranging from 11,000 to 40,000 kVA were installed with an aggregate capacity of 412,000 kVA. These include two 40,000-kVA Pelton wheel units, the highest capacity for horizontal water-turbines in East Asia, and three Kaplan 14,000-kVA 187.5 RPM turbo-alternators.

Flue-gas Cleaning Plant

POWER station flue-gas cleaning plant is the subject of B.S.S. 893, which has resulted from the investigations of a Committee (the chairman of which was Mr. A. N. East, of the Electricity Commission) which carried out experimental work as well as examined information available in this and other countries. That the problem has not been completely solved is due solely to complexities rather than to a lack of their recognition, but accumulated experience resulting from the adoption of the standard methods should enable further progress to be made.

The B.S.S. is in three parts as follows:—(1) Method for the determination of the emission of solids from a chimney; (2) method for grading the dust by air elutriation; (3) descriptions of various forms of sampling tube which may be used in dust sampling.

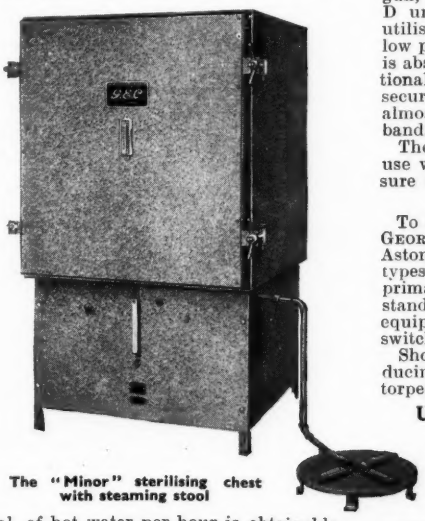
A number of diagrams are included and the appendix deals with the problem of ensuring uniform and uni-directional flow of flue-gases, one of the essentials for the reliable sampling of a dust-laden flue-gas stream. Copies of this specification may be had from the British Standards Institution, 28, Victoria Street, S.W.1, price 5s. 4d. post free.

NEW ELECTRICAL PRODUCTS

A Review of Equipment Recently Marketed

Dairy Sterilising Equipment

THE range of dairy sterilising chests supplied by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, now includes a "Minor" model, which is of 16 cu. ft. capacity and loaded at 3 kW. While lighter in construction than other G.E.C. chests it is of the same standard in design and workmanship. It is particularly easy to install and on normal AC mains can be connected to a 15-A circuit. Up to 10



The "Minor" sterilising chest with steaming stool

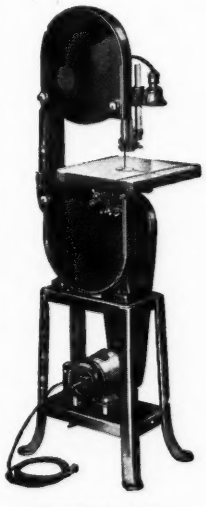
gal. of hot water per hour is obtainable, and an external pressure jet provides steam for milking machines, teat cup assemblies, churn stools, &c.

Another recent development, designed chiefly to fill the growing demand for electric steam raisers for supplying sterilising chests previously used with fuel-fired boilers, is a dairy steaming unit. This is a compact appliance and is available loaded at 6 or 9 kW. The 6-kW model may be used for chests up to 27 cu. ft. capacity, and the 9-kW type up to 48 cu. ft. The appliance also may be used for other purposes where steam is required.

All G.E.C. sterilising chests and steaming units now incorporate immersion heaters having automatic cut-outs, which prevent them from burning out if the water supply should fail.

Metal-cutting Bandsaws

The "Tauco" 14-in. metal-cutting bandsaws supplied by GASTON E. MARBAIX, LTD., 22, Carlisle Place, London, S.W.1, will find innumerable uses in all classes of tool and machine shops. The machine cuts extruded shapes square, bevelled or at any angle, and is especially suitable for fitting light, structural shapes. A mitre gauge groove in the table makes it easy to attach to the machine fixtures for cutting tubing, &c., on a production basis, and it can be fitted with a rip gauge for cutting strips off sheet metal. Besides cutting all kinds of metal, it can also be used on felt, asbestos, brake linings, bakelite and similar synthetic sheets, rods and tubes.



"Tauco" bandsaw

The ½-HP motor is arranged to give four metal-cutting speeds (125, 175, 250 and 340 ft. per minute) and a standard 2,220 ft. per min. for wood. The change-over from metal to woodwork is effected simply by operating a lever changing a belt and fitting a different blade.

Improved Spray Gun

The latest addition to the range of products made by B.E.N. PATENTS, LTD., High Wycombe, is the model DX spray gun, an improved version of the model D unit. A special principle employed utilises high pressure for atomisation but low pressure for distribution. The result is absence of spray fogging and an exceptionally smooth finish. Controls provided secure a wide range of spray pattern from almost a hair-line to a wide even-coated band.

The gun is available in two types for use with a siphon cup and with a pressure or gravity feed paint container.

Bakelite Lampholders

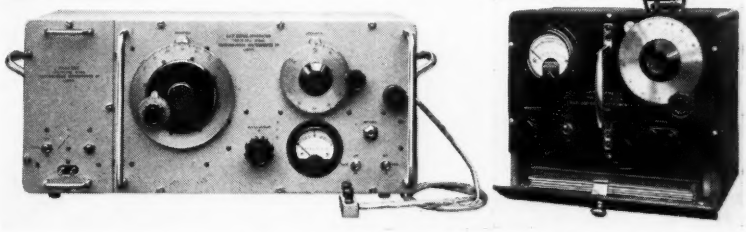
To their range of electrical accessories GEORGE TURNOCK, LTD., 41, High Street, Aston, Birmingham, have added certain types of screwed bakelite lampholders primarily intended for table and floor standards and other forms of lighting equipment. Units with or without a switch incorporated are available.

Shortly the company will also be producing switches of the press-button and torpedo types.

Ultra-high-frequency Instruments

Two new instruments for use in the ultra-high-frequency field are announced by MARCONI-EKCO INSTRUMENTS, LTD., Electra House, Victoria Embankment, London, W.C.2. The u.h.f. signal generator TF. 517 has been specially designed to fill the need for a generator having a frequency range of from 150 to 300 Mc/s (2 to 1 metres). In the design

Marconi-Ekco u.h.f. signal generator and (right) wavemeter



and construction of this instrument particular care has been taken so that all sections have great mechanical rigidity to ensure stability during the whole life of the instrument which does, in fact, bring to the u.h.f. measurement field the simplicity and accuracy hitherto associated only with measurements on the broadcast and short-wave ranges.

Stray radiation is well under one microvolt, while the inductive piston type attenuator gives great accuracy with the wide range of 0.1 to 1 microvolt (100 dB). The instrument dial is directly calibrated in frequency, calibration accuracy being to within ±1 per cent. For convenience in testing u.h.f. receivers, provision is made for balanced output, and the maximum output is approximately 0.1 V. The apparatus is designed to operate from the mains (200 to 250 V, 40 to 100 cycles).

The essential features of the other instrument, wavemeter TF. 643, are its simplicity in design and operation, its wide range (20 to 300 Mc/s.) and extreme portability. It is self-contained and the dry batteries internally accommodated will give many months of service. This instrument, too, has a calibration accuracy of ±1 per cent., which is claimed not only to be better than can normally be obtained by the Lecher wire system, but also to have the additional advantage of greater speed. Other instruments are already in hand in the 300 Mc/s. field.

Lightweight Hair Dryer

An extremely light hair dryer marketed under the name "Tesco" is available from the TITCHFIELD ELECTRO-SURGICAL CO., LTD., 2, Duncan Avenue, Gray's Inn Road, London, W.C.1. The case is of bakelite, available in five attractive colours—black, walnut, mahogany, red

"Tesco" hair dryer

and green, while the 450-W universal motor is exceptionally small and is fitted to a light aluminium fan.

Two quick-action switches are incorporated, giving "hot," "cold," "on" and "off," and the whole construction is shockproof. The motor is smooth and silent in operation and the high-precision bearings require the minimum of attention. The apparatus is supplied complete with a combined plug and adaptor.

Vacuum Cleaners

The new "Ferret" hand vacuum cleaner supplied by L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, London, W.C.2, is suitable for cleaning floors, mats, stairs, curtains, car interiors, &c. It is light in weight and the comfortably designed handle has a switch incorporated. Skirting, brush and 21½ in. metal extension tube attachments are provided. The body is pillar-box red, the bag being red and black.

"Ferret" hand vacuum cleaner

The same attractive colourings are used in the "Supreme" export model which the company has specially designed to capture overseas trade. This is a cylindrical type which, despite its low price, is most solidly constructed, shows 29in. suction on water gauge test, and has self-lubricating bearings and a motor fully insulated from the body of the machine. A full set of accessories is supplied with the cleaner. Limited supplies are available for sale in the home market.

COMMERCIAL and INDUSTRIAL NEWS

Reserved Occupations. A Refrigeration Association. Electric Vehicles at Glasgow

Overseas Trade Expands

IMPORTS of electrical goods and apparatus which had fallen off in March rose sharply in value last month, while exports continued their steady upward trend. At £1,356,688, electrical exports created a new record, and they were £433,983 (47 per cent.) more than in the corresponding month of last year. Imports, at £485,917, were not quite up to the high January total (£494,175), but were more than twice the April, 1939, amount of £231,846. Comparison is, however, somewhat disturbed by the occurrence of the Easter holiday in April last year and March this.

Reserved Occupations

A number of new entries in the Schedule of Reserved Occupations were announced last week by the Ministry of Labour and National Service. Workers in the electricity supply industry who are affected are as follows (ages are given in parentheses) :—Auxiliary plant attendant (30); boiler-house superintendent, combustion engineer, steam engineer (25); boiler cleaner, scaler, consumers' engineer, meter fixer (30); control engineer, relay engineer, district engineer and assistant, domestic appliance maintenance superintendent, junior engineer, generation engineer and assistant, installation inspector, mains development engineer and assistant, mains foreman, mains superintendent and assistant, distribution engineer and assistant, meter and testing superintendent and assistant, meter tester, meter inspector, chief technical officer (meters), power station superintendent and assistant, resident engineer and assistant, shift charge engineer, substation attendant and assistant, substation superintendent and assistant, substation inspector and assistant and technical assistant (all 25).

Mottram Hall

Sir Felix J. C. Pole, chairman of Associated Electrical Industries, Ltd., on May 18th opened Mottram Hall, the country house of Ferguson, Pailin, Ltd. The estate, consisting of 130 acres of some of the finest parkland in Cheshire, lies between Wilmslow and Macclesfield, about fifteen miles from Manchester, and was originally owned by the lords of the manor of Mottram St. Andrew. The fine old mansion, which has seen more than two centuries of English life, was purchased by Ferguson, Pailin, Ltd., in 1939. The interior has undergone extensive alterations without any of the magnificent oak panelling being sacrificed.

Mottram Hall is now a guest house for the company's employees, who may stay for a day, a week-end or a week at charges which are exceedingly modest. There are only such rules as will help to facilitate the smooth running of the house and ensure the comfort and convenience of guests. Amenities include tennis courts, golf course, lily pond with gold fish, ornamental lake dotted with tiny islands, lounges, assembly hall 40 ft. in length, billiard room, dining hall and new kitchens with modern equipment. There are thirty-four bedrooms to accommodate eighty guests. Special accommodation is provided for married guests, for young people and convalescents.

Ald. G. H. White, J.P., Lord Mayor of Manchester, presided at the official opening. Mr. Samuel Ferguson (chairman and managing director, Ferguson, Pailin, Ltd.) related how Mottram Hall came to be purchased and the reason. The basis of the company's relations with its employees, he said, was reciprocal service, which on the company's side was expressed in continuity of employment and doing all possible to promote the welfare of employees, who in the years ahead would have to train themselves to enjoy leisure.

Sir Felix J. C. Pole said he anticipated that Mottram Hall would be the rendezvous of competitive sporting events for which he would be glad to provide whatever cups and shields were necessary. There was no reason why in the future there should not be inter-works competitions with electrical works teams at Rugby, Birmingham and other places. Brief speeches were also made by Mr. F. Clegg (oldest staff employee) and Mr. J. Morris on behalf of the works employees.

Following the opening ceremony a service of dedication was conducted by the Rev. G. Bramwell Evens ("Romany" of the B.B.C.) in Mottram Hall Chapel, part of the main building.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that the cost-of-living figure on May 1st (80 per cent. above the 1914 level) will not involve any alteration in wages on the third pay-day in June.

Commercial Electric Refrigeration Association

The Commercial Electric Refrigeration Association (short title C.E.R.A.), has been formed to deal with commercial electric refrigerator plant and equipment up to 3 HP. The main objects of the Association are to promote, develop and protect business in commercial electric refrigerators and refrigeration equipment and to establish and maintain fair and reasonable conditions of sale and distribution. The chairman is Mr. E. G. Batt (G.E.C.), the vice-chairman Mr. M. G. Munce (York Shipley, Ltd.), and the secretary Mr. F. A. Rogers. The address of the Association is 36, Kingsway, London, W.C.2.

The following concerns have elected to become members:—Frigidaire, Ltd.; General Electric Co., Ltd. (Coldair, Ltd.); J. & E. Hall, Ltd.; H.M.V. Household Appliances; International Refrigerator Co., Ltd. (International G.E.C. of New York, Ltd.); Kelvinator, Ltd.; Marco Refrigerators, Ltd.; Lightfoot Refrigeration Co., Ltd.; Pressed Steel Co., Ltd.; L. Sterne & Co., Ltd.; York Shipley Ltd.

Glasgow Electric Vehicle Exhibition

The three-day electric vehicle exhibition held at McNeill's Garage, Bothwell Street, Glasgow, on May 14th, 15th and 16th, attracted a large number of Scottish business men whose transport problems are causing them to take more and more interest in the development of the electric vehicle. Lord Provost Dollan, accompanied by the Lady Provost of Glasgow, paid an official visit to the exhibition on the third day. Lord Provost Dollan gave the officials of the exhibition some interesting data on the subject of electric vehicle progress in New York which he had gathered from a long discussion on the subject with Mayor La Guardia during a visit to America. The exhibition was organised by the Electric Vehicle Association, and the exhibitors, who report very satisfactory inquiries, were as follows:—

Associated Electric Vehicle Manufacturers, Ltd. (10/12 cwt. van, one of 150 for London Co-operative Society and 18/22 cwt. van, one of 300 for Bristol Co-operative Society); Partridge, Wilson and Co., Ltd. (utility car and "Bulldog" chassis); Murphy Cars and Trucks, Ltd. ("Servitor" milk truck); Midland Vehicles, Ltd. (25-cwt. chassis and 30-cwt. van for McAulay's, bakers); Metropolitan-Vickers Electrical Co., Ltd. (18/22-cwt. chassis, 18/22-cwt. van for United Co-operative Bakery Society and demonstration controller and motor).

Batteries were shown by Chloride Electrical Storage Co., Ltd., D.P. Battery Co., Ltd., Tudor Accumulator Co., Ltd., and Young Accumulator Co., Ltd., and chargers by the Westinghouse Brake and Signal Co., Ltd. (30-cell, 20 A and 12-cell, 10 A). There were also on demonstration a 25-cwt. Midland lorry and a 7/9-cwt. Metrovick van.

We are informed that at the recent Leeds exhibition Associated Electric Vehicle Manufacturers, Ltd., also exhibited, showing a 25-cwt. Morrison chassis and a 20-cwt. Morrison mineral water float in course of delivery to Barraclough, Ltd.

Manufacture in New Zealand

In the course of an editorial recently the *New Zealand Electrical Journal* drew attention to the opportunities which now exist for the Dominion to build up an electrical manufacturing industry. Quoting Switzerland as an example of a small country which has created a big export trade in electrical equipment, our contemporary sees no reason why New Zealand should not occupy a similar position so far as the lighter products are concerned—it admits that the Dominion's geographical position precludes the supply of heavy plant.

In the first place it is considered that New Zealand manufacturers should "develop a style of manufacture and that quality of uniqueness which have done so much to put American appliances in the forefront of the world's market."

Then the *Journal* goes on to say :—"At present, bcause of war, there actually are export markets available to New Zealand. These are in the East, where supplies from European countries are cut off. It would be wise, we feel, if these markets were explored, and further wisdom could, with advantage, be displayed in using them as a basis for a development which has as its basis the suggestions outlined above."

Workmen's Compensation Limits

The Electrical Power Engineers' Association, the Association of Supervising Electrical Engineers, and other kindred associations, through the medium of the National Federation of Professional Workers, presented evidence before the Royal Commission on Workmen's Compensation sitting at Thames House, Millbank, on May 16th, against the restrictive nature of the present law on the subject of workmen's compensation.

Mottram Hall, a mansion purchased by Ferguson, Pailin, Ltd., as a guest house for its employees

The Federation pointed out that men and women who occupied executive, administrative and technical positions in industrial concerns, such as engineering works, electricity undertakings, shipbuilding yards, railways and factories generally, had no remedy under the Workmen's Compensation Act. Occupational accidents were no respecters of salary limits, and the non-manual workers strongly resented the injustiee brought about by the existence of the limit of £350 per year. The number of such persons engaged in industry to-day was increasing, and the technicians in particular might often be as much exposed to danger as the workmen whom they controlled.

It was unfair that such employees should be expected to insure themselves in order to relieve the employer of a burden which rightly should fall upon the employer as a part of the protection which should be afforded to the employee in respect of the risks unavoidably attaching to any and all employment, whatever the salary payable.

The National Federation urged the immediate application of compulsory insurance to all classes of employment, and contended that the doctrine of common employment should be abolished by legislation.

Great importance was attached to the need to get away entirely from the flat-rate maximum, and to replace it by payments proportionately related to earnings. Thus, in place of the present maximum compensation of 30s. per week for total incapacity, the National Federation would substitute 75 per cent. of the workers' normal weekly earnings for the period of total incapacity, provided that no such weekly payment should be less than £3 or the normal weekly earnings of the worker, whichever is the less. For partial incapacity, instead of the payment of half of the difference between former and post-accident earnings.

The Federation witnesses before the Commission were: Mr. G. W. Thomson (president), Mr. J. W. Thomas (Electrical Power Engineers' Association), and Mr. Stephen W. Smith (secretary). The Commission adjourned to take further evidence.

Brighton Council and J.I.C. Award

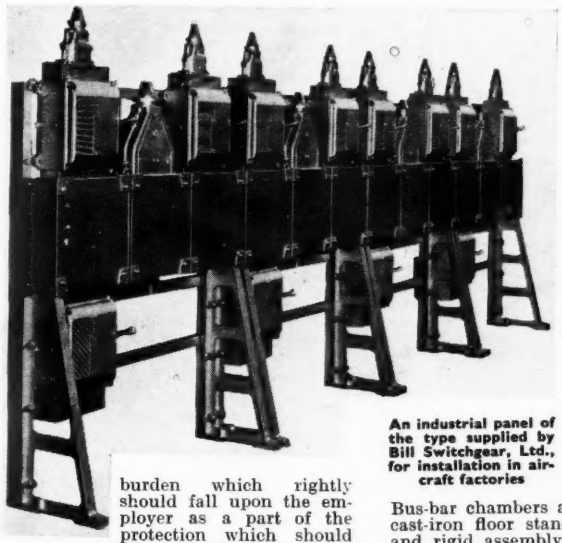
At last month's meeting of Brighton Town Council, when an award of the Joint Industrial Council for the Electricity Supply Industry of ½d. an hour increase to employees was considered, it was decided to withdraw from all Joint Industrial Councils unless "financial safeguards to the satisfaction of the Finance Committee" were obtained not later than June 1st next.

The Finance Committee has since received communications from a number of organisations concerned which wished to send representatives to appear before the Committee. It was decided to inform the J.I.C.'s and Whitley Councils that the Committee considered the following to be "financial safeguards": that where any decision of any such body necessarily would involve increased cost to the employers an opportunity should be given to enable them to give policy directions to their delegates. The Committee recommends that the Council should postpone withdrawing from the J.I.C.'s pending the receipt of replies to the resolution.

The Electricity Committee, to which the Council referred back the proposal for the payment of the extra ½d. an hour, has received a letter from the District J.I.C. pointing out that since the inception of the Council in 1919 there have been fifteen reductions totalling 9.72d. which have been accepted in good faith by employees, whereas increases, including the last award, amount to only 6.5d. The Electricity Committee is recommending the Council, as a member, to abide by the J.I.C. award.

Industrial Switch Panels

The accompanying illustration shows a typical industrial panel that is being supplied by Bill Switchgear, Ltd., to Lee Beesley & Co., Ltd., of Coventry, for installation in numerous new aircraft factories. Lee Beesley & Co. have been successful in securing many of the aero factory electrical installation contracts and the panels are manufactured and designed to the specific requirements of Mr. G. S. Nott of that company. The switches fitted are of the Bill new h.r.c. type with English Electric h.r.c. cartridges. These are fitted directly to the bus-bar chamber by means of flanges, so that the fuse switches can be easily interconnected by copper strip or cable. Bus-bar chambers are bolted directly to cast-iron floor stands, making a strong and rigid assembly. The panels, being self-supporting, are made suitable for installing in the centre of large factory bays, thereby saving long cable runs.



An industrial panel of the type supplied by Bill Switchgear, Ltd., for installation in aircraft factories

All switches and bus-bar chambers are fitted with glands and sealing boxes for armoured cable, and as all cables come from above a reverse type sealing box is fitted to the switches below the bus-bar chamber. Space is always left for fitting further switches when required. The panels can be readily extended, as arrangements are made for bolting an extension panel to either end of the existing panel. Lighting industrial panels are fitted with 100-A t.p. and neutral h.r.c. fuse switches, and the power panels are invariably fitted with 300-A or 200-A fuse switches.

Electric Vehicles at Warrington

In our last issue we briefly reported an electric vehicle exhibition which was held on May 7th by the Warrington Corporation Electricity Department. We have now received further details from Mr. Norman T. Smith, the borough electrical engineer.

A number of potential local users were interviewed by the Consumers' Department and as a result of this survey a classified list of vehicle users was prepared and a circular letter was sent to each.

Approximately 20 per cent. of the people approached intimated their interest in the proposed demonstration, and invitations were sent to them enclosing copies of the Electric Vehicle Association's booklets, "How to Reduce your Delivery Costs" and "The Electric Vehicle in War and Peace." At the same time advertisements were inserted in the local papers and in addition a special window display was given at the Corporation's showroom. The co-operation of five manufacturers and agents was obtained, namely, the Metropolitan-Vickers Electrical Co., Ltd., Partridge, Wilson & Co., Ltd., the Midland Electric Vehicles, Ltd., Leach & Seed, Ltd. (agents for Tilling Stevens, Ltd.) and Tom Garner (agent for Sunbeam Commercial Vehicles, Ltd.).

The exhibition was held at the works of the Electricity Department. Eight vehicles were displayed, two of which were chassis, having carrying capacities ranging from 7 cwt. to 3 tons. Also present were representatives of the D.P. Battery Co., Ltd., and the Tudor Accumulator Co., Ltd., with displays of their products.

Throughout the day a steady stream of local tradesmen visited the exhibition. Representatives of the Electric Vehicle Association, including the local honorary secretary, were also present, while representatives from other undertakings in the North-Western Area and tradesmen from other towns attended. During the afternoon one vehicle was sold and a number of other sales followed. The Consumers' Department is busy following up inquiries, and it is felt that the number of vehicles disposed of will be considerable.

Price Regulation Order

The Board of Trade has issued the Prices of Goods (Price Regulated Goods) Order, 1940, under the Prices of Goods Act, 1939. This Order, which covers many types of commodities, comes into force on June 10th and supersedes the Prices of Goods (Price Regulated Goods) (No. 1) Order, 1939. Among the goods included in the schedule are electric torches and lamps operated by dry batteries, and component parts and accessories; electric filament lamps; and domestic broadcast receiving sets, radiogramophones, parts and accessories.

A "Coming of Age"

On the eve of what should have been the beginning of their Whitsun holidays, employees of the Midland Electric Installation Co., Ltd., assembled at the company's works to hear a message from the managing director, Mr. H. Joseph, on the twenty-first anniversary of the firm's foundation. Mr. Joseph said that the actual coming-of-age was in February, but it was more convenient to celebrate the event that day (May 10th), which was the day after his son's 21st birthday. Sir Charles Mander congratulated the company on attaining its majority and hoped it would be able to celebrate its 150th anniversary, as his own company would be doing in the near future.

Prices of Materials

The only change in the prices of materials since May 8th of which we have been notified is the following: Henry Gardner and Co., Ltd., report, May 22nd: English block tin, £270 10s., £15 5s. increase.

New Catalogues and Lists

B.E.N. Patents, Ltd., Hughenden Avenue, High Wycombe.—Details of the new "DX" spray gun, an improved version of the model "D."

Londex, Ltd., 207, Anerley Road, S.E.20.—Catalogue SPN/3 containing details of the company's present range of electro-magnetic relays.

Philips Lamps, Ltd., Century House, Shaftesbury Avenue, W.C.2. — A catalogue dealing with the company's wide range of battery-charging equipment and industrial rectifiers.

W. Edwards & Co. (London), Ltd., Allendale Works, Southwell Road, Loughborough Junction, S.E.5.—A catalogue describing three new high vacuum pumps.

Rotherham & Sons, Ltd., Spon Street, Coventry.—A folder on movements for oil and steam pressure gauges and air speed indicators. A selection of non-ferrous small parts in which the company specialises is illustrated.

Lincoln Electric Co., Ltd., Welwyn Garden City.—A circular announcing that the Lincoln electrode for welding "Inconel" previously known as "Inconweld" will in future be called "Nichelchromeweld."

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department, through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:

MISER rubber-neck bench fittings.

ELECTRICITY SUPPLY

Durham Water-power Development Urged. Malaya Power Plant Extension Scheme

Bedford.—HIGHER COST OF FREIGHTAGE.—The Electricity Committee reports that the 10 per cent. advance in freightage and wagon hire charges represents an increase of £2,500 per annum. The previous increase amounted to £7,500, making a total advance to date of £10,000 for one year.

Brighton.—ELECTRIC WINCHES STIPULATED.—In reply to an inquiry from the Sussex Sea Fisheries District Committee, the Watch Committee has stated that it is not prepared to permit petrol-motor winches to be placed on the beach for hauling up fishing boats, but will allow the use of electric winches.

COOKERY DEMONSTRATION SUGGESTION.—The Education Committee recently considered a proposal that empty shop premises owned by the Corporation should be utilised for cookery demonstrations, on the understanding that the Electricity Department as well as the local Gas Company would lend a cooker for each shop. The expenditure on four shops was estimated at £500, including £30 for the installation of cookers. The Committee rejected the scheme, but the matter is to come before the monthly Council meeting.

Cheltenham.—NEW SWITCHGEAR.—It is proposed to increase the switchgear at substations at a cost of £1,539.

Chester.—RURAL SUPPLIES.—A scheme has been approved for the provision of an electricity supply to premises in the rural area at a cost of £3,400.

MAINS AND SERVICES.—The Electricity Committee is seeking sanction to borrow £12,000 for mains and services.

Durham.—HYDRO-ELECTRIC POSSIBILITIES.—At a meeting of the South-West Durham Development Board last week at Bishop Auckland it was reported that the plan drawn up recently for the production of a cheap electricity supply by harnessing water power on Tees-side had been referred to the Ministry of Supply. The Ministry had been informed that if a cheap supply of electricity could be obtained it would be possible to set up an industry for the production of calcium carbide. The Ministry, it was stated, informed the Board that the matter would be kept under consideration.

SCHOOL INSTALLATIONS.—The County Education Committee has approved the provision of electrical installations at three more schools.

Fort William.—TURBINES CLOSED DOWN.—The turbines set up on the River Kiachnish in the mountains three miles from Fort William forty-four years ago to generate electricity for lighting Fort William were closed down on Saturday last. The town and the nearby villages of Corpach and Banavie now obtain electricity from the hydro-electric plant of the British Aluminium Co. at Lochaber. The old turbines were installed in 1896 by the Fort William Electric Lighting Co. Two years ago the plant was taken over by the Town Council, which has since entered into an agreement with the Lochaber Power Co. for the supply of electricity in bulk.

Hastings.—SUPPLY EXTENSION.—Mains are to be extended to provide a supply to Beech Hill Farm, Netherfield.

LOAN SANCTION.—The Electricity Committee has obtained sanction to borrow £10,894 for apparatus and meter testing equipment.

Middlesbrough.—NEW SUBSTATIONS.—The Town Council contemplates spending £542 out of revenue on the provision of substations in Acklam Road South and at Prissick Farm.

Northern Ireland.—SUPPLY FAILURE.—In our May 3rd issue we reported that a serious breakdown on the Northern Ireland grid system resulted in the greater part of the counties of Antrim, Armagh, Down, Tyrone, Derry and Fermanagh being deprived of light and power for varying periods, and stated that it was not until after twelve hours that the system was fully tested and restored. It has been pointed out that the supply was restored to the majority of consumers in times varying from 55 min. to 3 hr. 15 min., and at the latter stage the only consumers off supply were those in three small villages. Repairs on a section of line were deferred until after midnight in order to avoid interruption to a power supply and thus complete repairs to the system were not carried out until a period of approximately 12 hours after the first incident of the faults, but consumers were not, of course, affected for this period of time. The cause of the failures was established to be lightning.

Oxford.—ASSESSMENT OF UNDERTAKING.—At a recent meeting of the Town Council the Electricity Committee reported that the electrical engineer had received a proposal from the rating authority to increase the assessment of the undertaking from £31,123 to £41,673.

Plymouth.—ASSISTED WIRING TERMS.—The charges for assisted wiring installations have been revised, the new rate of purchase for lighting installations being 1s. 3d. per point per quarter (20 payments) with a minimum of three points. For 2-A plug sockets the charge is 1s. 3d. per point per quarter (20 payments) with a new assisted wiring installation and 1s. 7d. with existing installation, the minimum number of sockets being two.

ADDITIONAL BULK SUPPLY MAIN.—The Electricity Committee is seeking sanction to borrow £1,091 for an additional main for the bulk supply to Plympton R.D.C.

Rawtenstall.—PRICE INCREASE.—The Electricity Committee has increased its charges by 5 per cent.

Retford.—LARGE INCREASE IN OUTPUT.—At the last meeting of the Town Council the electrical engineer reported that during the year ended March 31st last 11.2 million kWh was sent out, compared with 8.8 million kWh in the previous year, an increase of 27 per cent.

SUPPLY SCHEMES.—Proposals were approved for the provision of electricity supplies to houses at Rampton, a pumping station at Misson, and a flour mill. For the supply to the mill it will be necessary to install a seven-panel switchboard in the power station and a three-panel board in the mill. Application is being made for sanction to borrow £1,650 for the mill and pumping station supplies.

Ripon.—ELECTRICITY AND GAS ARRANGEMENT.—It was reported to the Gas Committee recently that the Harrogate borough electrical engineer and the gas manager had met to discuss the position where persons wished to change from gas appliances to electrical equipment or *vice versa*. The outcome of the meeting was a suggestion that inquiries should be made to ascertain whether an applicant desiring to change was already receiving satisfactory service and also the financial commitments already involved. It was decided to try the scheme.

Sleaford.—SUPPLY TO HOLDINGHAM.—A revised scheme for a supply to Holdingham is being considered by the Electricity Committee.

Stockton-on-Tees.—DISTRIBUTION WORKS.—The Town Council proposes to increase the capacity of the transformer at Mile House substation from 100 kVA to 200 kVA at a cost of £320. An additional cable is to be laid from Norton Road substation to Head Wrightson's Forge Works at a cost of £500. Application is to be made to the Electricity Commissioners for sanction to borrow £1,000 for substation equipment.

Wolverhampton.—SUPPLY TO FARM.—The Electricity Committee is to provide a supply to Pennymore Hay Farm, Four Ashes, at a cost of £204.

Overseas

Australia.—CONTROL OF GENERATION IN N.S.W.—The New South Wales Premier stated recently that he favoured the creation of a central authority to control the generation of electricity. According to the *Electrical Engineer and Merchandiser* (Australia) he said he expected to receive a report soon on what should be done to carry out such an arrangement, and mentioned that the Minister for Works and Local Government had been asked to prepare a report for the Cabinet. He considered that a central authority should sell energy to local bodies for distribution.

CHIMNEY RESTORED.—At the outbreak of war one of the new chimney stacks at the Sydney County Council's Bunnerong power station was shortened from 300 to 160 ft., but the results were most unsatisfactory and the stack has been restored to its original height.

Italy.—ELECTRICAL OUTPUT.—The production of electricity in Italy last year was roughly 18,000 million kWh; this year it is hoped to produce 19,000 million kWh, and by 1943 not less than 25,000 million kWh.—*Reuter's Trade Service.*

Malaya.—ADDITIONAL POWER PLANT.—The *Malaya Tribune* reports that a scheme to extend the plant in the country's largest power station, at Singapore, will shortly be put in hand. With the additional plant, which it is hoped will be in commission by 1943, the St. James's station will be one of the best equipped in the East. The scheme is part of a long-range plan of gradual expansion. The station started generating in June, 1927, and the first extension was authorised the same month owing to the rapid growth of the demand for electrical energy which it was considered was bound to follow the reduction in charges.

CONTROL OF MALACCA SUPPLY.—Discussion has recently taken place between Malacca Electric Lighting, Ltd., and the Municipal Commissioners arising out of a decision by the Commissioners to operate the town's supply as a municipal undertaking. At the annual meeting of the Company the chairman stated that since the issue of the report the Governor had advised them that he was unable to intervene in the matter.

TRANSPORT

Darlington.—LOAN FOR TROLLEY-BUSES.—The Town Council has received sanction to borrow £15,000 for the purchase of eight trolley-buses.

Maidstone.—OBJECTIONS TO ORDER WITHDRAWN.—Kent County Council has now withdrawn its objections to the Maidstone Corporation Trolley Vehicles Provisional Order.

Manchester.—NEW TROLLEY-BUSES.—Overhead equipment is being erected for the early running of trolley-buses from Guide Bridge to Haughton Green.

Newcastle-on-Tyne.—NEW TROLLEY-BUS ROUTES.—The Ministry of Transport has made a Provisional Order authorising the City Council to introduce trolley-buses on additional routes in the city. A Bill to confirm the Order is to be introduced in Parliament.

Switzerland.—MORE RAILWAY ELECTRIFICATION.—The recently completed electrification of the Lucerne-Brienz section of the Brunig railway between Lucerne and Interlaken is described in a recent issue of the Bulletin of the Swiss Association of Electrical Engineers. The part of the line between Brienz and Interlaken has been electrically operated for some time, but on the Brienz-Lucerne section, owing to the severe gradients, two types of steam-operated rack locomotives have so far been employed. These have now been replaced by sixteen special electric locomotives adapted to work on both the ordinary and rack sections.

New Zealand Engineering Conference

UNDER the presidency of Mr. A. J. Baker, the New Zealand Institution of Engineers held its annual conference at the Technical College, Wellington, there being a record attendance of 230 members from all parts of the Dominion.

The important part which engineers have played in developing New Zealand was traced by Mr. Baker in his presidential address, among the subjects touched upon being hydro-electric work.

Papers presented included one on "Recent Developments in Electrical Traction," by Mr. W. R. Horne. The annual report of the Council showed that the membership had increased by 37 to 615. The new president is Mr. E. Hitchcock, general manager of the Christchurch Electricity Department.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1938

21305. "Automatic or semi-automatic telephone or like exchange systems." Standard Telephones & Cables, Ltd., and G. E. Peters (L. Kozma and S. Simon in part). July 18th, 1938. (Addition to 484647.) (520476.)

25115. "Noise-limiting circuits for carrier-wave communication systems." A. A. Thornton (Philco Radio & Television Corporation). August 26th, 1938. (520426.)

27375. "Television transmission station, and method of carrying out a complete television transmission service." Radio Akt.-Ges. D. S. Loewe. September 23rd, 1937. (520531.)

27813. "Control systems for electrically driven machine tools." British Thomson-Houston Co., Ltd. September 24th, 1937. (520578.)

29134. "Railway signal and/or points-control equipment." Standard Telephones & Cables, Ltd., J. B. Griffiths, A. Brown and T. A. Marshall. October 7th, 1938. (Addition to 496495.) (520580.)

29788. "Magnetic compasses." P. Kollsman. October 14th, 1937. (Cognate application 29789/38.) (520431.)

29909. "Apparatus for separating suspended matter from liquids by means of electrostatic precipitation." J. Bibby & Sons, Ltd., Sturtevant Engineering Co., Ltd., and A. Ibison. October 15th, 1938. (520481.)

30002. "Manufacture of lamp fixtures and light fittings, and/or parts thereof or for same." A. Hauskind. October 17th, 1938. (520380.)

30025. "Time-controlled mechanism, and the testing thereof." English Electric Co., Ltd., G. Tilstone and J. F. Donelly. October 17th, 1938. (520382.)

30217. "Electric wiring arrangements for garage and workshop inspection lamps." G. A. Edwards. October 19th, 1938. (520435.)

30295. "Electric switches, more particularly tumbler switches." J. H. Tucker & Co., Ltd., and F. C. Fuke. October 20th, 1938. (520482.)

30324. "Electric lamps." J. Lucas, Ltd., and E. A. Watson. October 20th, 1938. (520387.)

30419. "Electric switchgear of the enclosed type." English Electric Co., Ltd., and A. M. Pooley. October 20th, 1938. (520403).

30488. "Pick-ups for electric sound-producing apparatus." Scharf Nachfolger Ges. für Radio-und Phonoteile Geb. November 5th, 1937. (520447.)

30513. "Electric cable systems." Okonite-Callender Cable Co., Inc. November 5th, 1937. (520409.)

30517. "Electrical motor-operated switching arrangements." Telefunken Ges. für Drahtlose Telegraphie. October 21st, 1937. (520410.)

30523. "Relaxation oscillation generators." Standard Telephones & Cables, Ltd., and D. H. Black. October 21st, 1938. (Addition to 485120.) (520411.)

30526. "Means for mounting cathode-ray tubes." Kolster-Brandes, Ltd., and C. N. Smyth. October 21st, 1938. (520412.)

30529. "Multiplex high-frequency signal-transmission systems." Standard Telephones & Cables, Ltd. October 30th, 1937. (520448.)

30591. "Switch controls for electrically heated washing tanks." R. F. Cottingham. October 22, 1938. (520449.)

30595. "Apparatus for controlling the production of inert atmospheres." British Insulated Cables, Ltd., L. C. Bannister and W. J. Clements. October 22nd, 1938. (520450.)

30601. "Securing of conductors on magnetic teeth or poles, and more particularly in dynamo-electric machines." Bendix Aviation Corporation. October 25th, 1937. (520418.)

30631. "Control of battery charging generators for use in vehicle installations." R. Bosch Ges. October 23rd, 1937. (520487.)

30652. "Deflecting circuits for use with cathode-ray tubes." Fernseh Akt.-Ges. October 23rd, 1937. (520489.)

30688. "Dielectric and cooling mediums." British Thomson-Houston Co., Ltd. October 23rd, 1937. (520532.)

30698. "Motor-driven headstock for grinding and like machines, and for other machine tools." A. W. Wigglesworth. October 24th, 1938. (520495.)

30705. "Electric remote-control systems." Marconi's Wireless Telegraph Co., Ltd. October 23rd, 1937. (520498.)

30727. "Electrical signalling systems." Automatic Telephone & Electric Co., Ltd., P. M. Roseby and J. F. Mackenzie. October 24th, 1938. (520500.)

30793. "Electric dry-shavers." Remington Rand, Inc. November 10th, 1937. (520538.)

30833. "Picture-transmission systems." W. Jones and Pye, Ltd. October 25th, 1938. (52058.)

30852. "Thermionic amplifiers." Standard Telephones & Cables, Ltd., and A. H. Roche. October 25th, 1938. (520549.)

30855/6. "Electric dry-shavers." Remington Rand, Inc. November 27th, 1937. (Additional to 520538.) (520550/1.)

30867. "Portable electric hand lamps for use in mines." P. Stoppel and Friemann & Wolf Ges. October 25th, 1938. (520554.)

30934. "Electrical vacuum annealing and fusion furnace heated by glow-discharge." B. Berghaus. January 25th, 1938. (520589.)

30935. "Heating of ovens by electric glow-discharge." B. Berghaus. April 6th, 1938. (520590.)

30937. "Apparatus for metallising articles by means of cathode disintegration." B. Berghaus. July 1, 1938. (520591).

30939. "Metallising metallic articles by means of cathode disintegration in vacuum." B. Berghaus. November 19th, 1937. (Cognate application 30940/38.) (520592.)

31453. "Retractive electric switches." British Thomson-Houston Co., Ltd. October 30th, 1937. (520459.)

31458. "Means for generating electrical saw-tooth oscillations." General Electric Co., Ltd., E. C. Cheert and R. J. Clayton. October 31st, 1938. (520460.)

31459. "Electric lamps having sealed envelopes." General Electric Co., Ltd. (Patent-Treuhand Ges. für Elektrische Glühlampen). October 31st, 1938. (520461.)

31460. "Electric circuits comprising thermionic valves incorporating guiding grids. General Electric Co., Ltd., and R. W. Sloane. October 31st, 1938. (520462.)

31961. "Magneto-strictive vibrators." Electrical Research Products, Inc. November 11th, 1937. (520516.)

32007. "Sockets adapted to co-operate with the bayonet caps of electric lamps." General Electric Co., Ltd., and H. J. A. Turner. November 4th, 1938. (520517.)

32389. "Carrier-wave transmission systems." Standard Telephones & Cables, Ltd. December 4th, 1937. (520561.)

33077. "Electric fuses." British Thomson-Houston Co., Ltd. November 13th, 1937. (520601.)

33184. "Protective arrangement for thermionic valve apparatus." Standard Telephones & Cables, Ltd. November 16th, 1937. (520605.)

33189. "Radio direction-finders." Standard Telephones & Cables, Ltd. (Material Telephonique Soc. Anon). November 15th, 1938. (520606.)

33232. "Directional radio receivers." A. Carpmael (Telefunken Ges. für Drahtlose Telegraphie). November 15th, 1938. (520609.)

36638. "Current-collectors for electric vehicles." F. Cook, H. E. Witts and London Passenger Transport Board. December 16th, 1938. (520470.)

1939

381. "Contact device for time switches." Landis & Gyr Akt.-Ges. November 19th, 1938. (520613.)

905. "Electric switch contact drums." Therma Fabrik für Elektrische Heizung Akt.-Ges. January 17th, 1938. (520620.)

5073. "Heating device." Therma Fabrik für Elektrische Heizung Akt.-Ges. February 16th, 1938. (520565.)

11350. "Band-pass filters." Hazeltine Corporation. November 10th, 1937. (Divided out of 510652.) (520422.)

14871. "Circuits comprising electric discharge tubes." Philips Lamps, Ltd. May 21st, 1938. (Addition to 491063.) (520423.)

16078. "Superheterodyne radio receivers supplied by alternating current." Philips Lamps, Ltd. June 3rd, 1938. (520622.)

18267. "Electric discharge tubes for the optical indication of voltages." Mullard Radio Valve Co., Ltd. June 25th, 1938. (520623.)

18485. "Electric incandescent lamps or discharge tubes." Philips Lamps, Ltd. June 27th, 1938. (520624.)

Limitation of Dividends Bill

THE full text was issued last week of the Limitation of Dividends Bill, which covers every company within the meaning of the Companies Act, 1929, and to which the Act applies by virtue of Section 317, 318 or 333, and every company incorporated by Act of Parliament or by Royal Charter. Private companies within the meaning of the Act and any company not having a share capital are excluded.

For "existing" companies (whose first accounting period after incorporation ended before July 1st, 1939) the maximum distribution for any war dividend period is to be calculated as follows:—

(a) The amount distributed by way of ordinary dividend is to be ascertained for each accounting period of the company ending after June 30th, 1936, and before July 1st, 1939.

(b) If the war dividend period is greater or less than any such "standard" period, or if the paid-up ordinary capital at the end of the war dividend period is greater or less than it was at the end of the standard period, the amount distributed in respect of the standard period shall be deemed to be increased or reduced proportionately.

(c) The maximum distribution of the company for the war dividend period is to be the highest amount distributed in any standard period, increased or reduced as stated, or an amount equal to interest for the war dividend period at the rate of 4 per cent. per annum on the paid-up ordinary capital of the company at the end of the period, whichever is the greater.

In the case of other than "existing" companies the maximum distribution for any war period will be a sum equal to interest for that period at the rate of 5 per cent. per annum on the paid-up ordinary capital at the end of the period.

In computing the amount of the paid-up ordinary capital at the end of any war dividend period any amount paid up in respect of bonus capital out of the assets of the company since the end of the standard period in question is to be disregarded where the computation is made for the purpose of (b) and since the end of the last of the standard periods for (c). For new companies all bonus issues are disallowed. The reduction or alteration of share capital is restricted.

On the application of any company the Treasury may direct that the maximum distribution as ascertained shall be increased, in view of the nature of the business carried on or any other special circumstances. It may also make regulations modifying the provisions in regard to special classes of companies and may exempt subsidiary companies.

FINANCIAL SECTION

New Companies. Capital Returns. Debenture Charges. Bankruptcies and Liquidations. Reports and Dividends. Stocks and Shares

New Companies Registered

Shearex, Ltd. — Private company. Registered May 13th. Capital, £2,000. Objects: To acquire the business carried on by A. E. Shearing at Albion Works, Lampeter Street, N.1, and to carry on the business of manufacturers of and dealers in bakelite plastic mouldings, compounds and synthetic products of all kinds, &c. Subscribers: A. W. Bayley, "Whitefriars," St. Andrew's Road, Coulsdon, Surrey, and G. R. Howden, 23H, Peabody Estate, Wild Street, Kingsway, W.C.2. Registered office: High Holborn House, 52-4, High Holborn, W.C.

Universal Rediffusion, Ltd.—Private company. Registered May 16th. Capital, £2,500. Objects: To erect, manage and operate wireless stations and all necessary accommodation and apparatus for the reception and distribution by wired circuits or otherwise of wireless signals, messages and programmes, and to carry on the business of consulting and wireless experts and engineers, &c. Directors: H. Brennan, 115, Durham Road, Gateshead, G. Young Hughes, Whale Hotel, Eyemouth, Berwickshire, and J. E. Favell, 113, Moorside, Fenham, Newcastle. Secretary: J. E. Favell. Registered office: 22, Eldon Square, Newcastle-on-Tyne.

Dublin Electrical Engineering Co., Ltd.—Private company. Registered in Dublin May 3rd. Capital, £1,000. Objects: To carry on the business of electrical engineers, contractors, suppliers of electricity, &c. Subscribers: J. Healy, 9, Orchard Road, Drumcondra, Dublin; and F. L. Scott, "St. Marys," Strand Road, Sutton, Co. Dublin.

B. W. H. Engineers, Ltd.—Private company. Registered May 6th. Capital, £1,500. Objects: To carry on the business of electricians, mechanical, engineers and manufacturers, founders, workers of and dealers in electricity, motive power and light, &c. Directors: C. H. Woodfield, 8, Devonshire Mansions, W.1; and C. A. Bandfield, 210, Salmon Street, Kingsbury, N.W.9. Secretary: H. Holmes, 13, Fenchurch Avenue, E.C. Registered office: 16/17, Kirby Street, Hatton Garden, E.C.1.

West Wales Wireless Relay, Ltd.—Private company. Registered May 17th. Capital, £1,000. Objects: To construct and maintain broadcasting and other stations for wireless relay, &c. Directors: E. H. L. Harries, Maerdy, Portfield, Haverfordwest; R. Miller, 34, New Road, Haverfordwest; and Priscilla W. Harries, address not stated.

Duralife Batteries, Ltd.—Private company. Registered May 17th. Capital, £100. Objects: To carry on the business of electrical equipment specialists, manufacturers of and dealers in batteries, accumulators, &c. Subscribers: N. Spiro, The Beeches, Rathgar Close, Church End, Finchley, N.3, and M. Marks, 9, Newington Causeway, S.E.1. Secretary: M. Marks. Registered office: Vulcan House, 56, Ludgate Hill, E.C.4.

Companies' Returns

Statements of Capital

Crompton Parkinson, Ltd.—Capital, £2,000,000 in 200,000 first preference and 500,000 second preference shares of £1, and 600,000 ordinary and 4,600,000 "A" ordinary shares of 5s. Return dated December 29th, 1939. 170,725 first preference, 500,000 second preference, 600,000 ordinary, and 4,317,769 "A" ordinary shares taken up. £637,654 2s. 8d. paid (£1 on 6,965 first preference and 423,238 second preference, 5s. on 200,000 ordinary and 426,680 "A" ordinary, and 7s. 6d. on 133,760 first preference), including £621 2s. 8d. paid on 2,240 forfeited shares. £1,264,134 5s. considered as paid (£1 on 30,000 first preference and 76,762 second preference, 5s. on 400,000 ordinary and 3,891,089 "A" ordinary shares, and 12s. 6d. on 133,760 first preference shares). Mortgages and charges nil. Since the date of this return all the above shares have been converted into stock.

Lithanode Co., Ltd.—Capital, £3,000, in £1 shares. Return dated December 31st, 1939. 2,327 shares taken up. £627 paid. £1,700 considered as paid. Mortgages and charges, £5,000.

Mortgages and Charges

"J.D." Insulating Co., Ltd.—Mortgage and charge on leasehold land and premises known as 486, Hawthorne Road, Bootle, with plant and machinery, and the company's undertaking and property, present and future, including uncalled capital, dated May 3rd, 1940, to secure all moneys due or to become due from the company to the Midland Bank, Ltd.

Keighley Electrical Engineering Co., Ltd.—Satisfaction in full on March 30th, 1940, of debentures authorised November 8th, 1934, and registered November 15th, 1934.

Company Liquidations

Curtis Lighting Co. of Great Britain, Ltd.—Particulars of claims by June 30th to Messrs. W. E. Bush and A. T. Neale, Crown House, Aldwych, London, W.C.2, the liquidators.

Midland Electric Wire Co., Ltd.—Meeting of members, pursuant to Section 236 of the Companies Act, 1929, on June 17th, at Surrey House, Embankment, Westminster, to receive an account of the winding up by the liquidator, Mr. A. Watson.

John Fisher & Sons, Ltd.—Winding up voluntarily. Liquidator, Mr. C. V. Smith, 15, Rodney Road, Cheltenham.

Bedford Electrical & Radio Co., Ltd.—Winding up voluntarily. Liquidator, Mr. N. Bell, 1, Lime Street, Bedford.

The Electricity Co. of Macclesfield, Ltd.—Meeting of members on June 24th at Magnet House, Kingsway, W.C.2, to receive an account of the winding up by the liquidator, Mr. J. W. Davies.

Bankruptcy Proceedings

H. J. Bruchsaler, trading as H. J. Brooklyn & Co., lately carrying on business at Daimler House, Paradise Street, Birmingham, electrical distributor.—This debtor appeared at the Court House, Corporation Street, Birmingham, recently, for his adjourned public examination. It was reported that no statement of affairs had been lodged and the debtor was now in an internment camp. In reply to questions the debtor said that his unsecured liabilities in this country totalled £6,102, but if the war had not started an amount of over £7,000 would have been payable to him. The debtor further stated that a sum of about £4,000 should also be due to him at a bank in Baden-Baden. With regard to the cause of his failure, the debtor said he expected to receive large amounts from abroad, including one of £7,549 in royalty for patents sold in Switzerland and France. At the beginning of last year, however, Germany declared that all patents were State property and not the property of the individual. The debtor's business related to neon signs.

J. V. Reynolds, trading as British Electrical Installations Co., 7, Lambs Conduit Street, London, W.C.—The first meeting of creditors in this matter was held on May 17th at London Bankruptcy Buildings. Mr. C. Bruce Park, Official Receiver, reported that the debtor was now serving in H.M. Forces. He had not yet filed a statement of affairs, and very little information regarding debtor's trading was available. There had been several private meetings of creditors held recently. A resolution was passed for Mr. W. Jackson to act as trustee of the estate.

W. T. Robinson and **H. Atterby** (J. P. Beckett & Co.), electrical engineers, 134, Victoria Street, Great Grimsby.—Last day for receiving proofs for dividend, May 31st. Trustee, Mr. H. S. Bloomer, 8, Flottergate, Great Grimsby, Official Receiver.

H. Atterby, electrical contractor, 11, Andrew Road, South Ferriby, Barton-on-Humber, and lately residing and carrying on business at 1, Ash Tree Avenue, Great Grimsby.—Last day for receiving proofs for dividend, May 31st. Trustee, Mr. H. S. Bloomer, 8, Flottergate, Great Grimsby, Official Receiver.

Reports and Dividends

The Brush Electrical Engineering Co., Ltd., held its annual meeting on May 21st, when Sir Ronald W. Matthews (chairman), who presided, said that last year he stated that the reorganisation through which the works was passing would occupy their activities during the first part of the year now under review, and the results of 1939 would be adversely affected by this disturbance. In actual fact the reorganisation period extended to nine months of the year and in view of this the trading results could be considered as satisfactory. They had received a large number of turbine orders during the year, including a repeat order from the Brighton Corporation Electricity Department. An improvement had also been shown in the orders received for transformers and their efforts to develop this department were meeting with success.

They were now developing their range of electrical products and a new sales organisation was being built up to deal with this side of their business. The output of Petter engines steadily increased during the year, notwithstanding the necessity of allocating a large proportion of engine turnover to fulfil Government contracts. During the year they had continued their research and development of new designs on both their engine and electrical products, and as a result they would, after the war, be in a position to enter the world's markets with up-to-date products.

Since the last meeting they had added a further product to their existing range, having acquired the manufacturing rights of the Koella gas producer for motor vehicles. This was being marketed under the name of Brush-Koella and they had appointed distributors over the whole of the British Isles to handle sales and service of these producers. He had again to report a very considerable increase in the orders in hand as compared with a year ago. Their subsidiary, Brush Coachwork, Ltd., had been well occupied during the year in the production of bus bodies and on sub-contract work from the parent company.

The Marconi International Marine Communication Co., Ltd., held its annual meeting on May 20th when Mr. H. A. White (chairman), who presided, said that the war had two effects. First it retarded the expansion of normal business observed in the first eight months of 1939, and secondly, it led immediately to augmented expenditure. The ships of the mercantile marine were under Government control, and the company's organisation had been placed at the disposal of the authorities for any services which they might be required to render. Mr. White paid tribute to the heroic services rendered to the company by their radio officers, twenty-three of whom had lost their lives. War conditions had also thrown heavy additional burdens on their shore staffs. With regard to the future, if they covered losses in respect of their investments in foreign subsidiary and associated companies by drawing on reserves, and if in other respects the next seven months were no worse than the period since January 1st, the amount available at the next annual meeting should at least equal the sum now available.

Cable & Wireless, Ltd. (the operating company), reports that the revenue for 1939 passed all records and reached £5,730,929. The net profit is £1,610,369, an increase of £609,164 as compared with 1938. As already announced, the dividend for the year is raised from 3½ to 4 per cent., and the balance carried forward is £437,836, and this sum is available for any E.P.T. which may be assessed and for other payments.

At the annual general meting of the company held on May 21st Sir Edward Wilshaw (chairman and managing director) said that the Colonial wireless telegraph and telephone installation sets went out from England in the early days

(*Continued on page 579.*)

STOCKS AND SHARES

TUESDAY EVENING.

THE near approach of the war to this country, caused by the German advance, has had the effect of making Stock Exchange business difficult, and of depressing prices in most markets. The general attitude of the House can be described as cautiously confident. Of the final issue of the war no doubt whatever is expressed. As to what may have to be undergone before that end comes in sight, the warnings of the Prime Minister and other responsible authorities are present in most people's minds. The immediate result, regarded purely from the financial point of view, is to induce people to keep their surplus money easily available. To this end, efforts have been made to sell stocks and shares, liquefying the position of shareholders and putting them into possesion of hard cash. To what extent such a policy is prudent, it remains for the course of events to demonstrate. This selling, combined with an absence of purchasing power, has brought down prices, as will be noticed from our lists, in all the departments with which the quotations deal.

Home Railway Stocks

Earlier this year Southern 5 per cent. preferred stock stood at 79; during the past day or two stock has changed hands at 48. The company's 5 per cent. preference stock, which was up to 104½ a few weeks ago, is now 10 points below that figure. London Passenger Transport stock from 65 this year has gone back to 37½, a drop of 27½ points. Southern preferred at 55 shows a drop of 26 points from the best price touched in 1940. The stock has changed hands at 50 this week.

The reason for the falls in these, and in other home railway stocks, is the fear of enemy air action. The Government has guaranteed, in its agreement with the companies, to pay the first £10 millions of damage sustained by the home railways from attack by air. As the war cloud drew nearer to these shores, so the stream of selling of home railway stocks increased. This, Tuesday, morning some people braver than others took the view that the slump was being overdone. A little buying came along and served to wipe out a portion of the previous drop. In the market it is maintained that fears have been exaggerated, though due recognition is made of the impossibility of estimating to what extent damage might be done by hostile aircraft to the home railway or, for the matter of that, to any other industry. In sympathy with the falls in transport stocks, Thomas Tilling shares have gone back 4s. 6d. to 37s. 6d. British Electric Tractions remain unchanged.

Electricity Supply Shares

The same sentiment of fear of what might happen as a consequence of air attack is having a marked influence in the list of home electricity supply shares. Falls ranging from 6d. to 3s. 9d. have occurred in a number of cases. These declines have reduced prices to the lowest of the year in about half a dozen instances. The same tendency is noticeable amongst the shares of the overseas companies, though not, of course, to the same extent or for the same reason. Victoria Falls Power ordinary shares have dropped 5s. to 70s. on the sales by people anxious to raise cash. Whitehall preference have gone back to 14s., at which the return on the 7¼ per cent. dividend comes to £10 14s. 4d. per cent. Tokyo Electric sixes, on a 5 point drop to 57½, return £10 8s. 8d. per cent Atlas Electric relapsed to half a crown.

Indiscriminate Sales

Amongst the equipment and manufacturing shares, the principal interest is centred around General Electrics. Active dealings have left the price 44s. lower on the week at 76s. The dividend declaration is near at hand. Anticipation looks for 20 per cent., the same as last year. The figures are thought likely to be exceedingly good. Falls of 2s. 6d. or more have occurred in British Aluminium, Callenders, Murex, Associated Electric, Revrolle, Tube Investments and Westinghouse Brake shares. Other declines are of mostly minor extent. An illustration of the indiscriminate nature of the marking-down is furnished by Every Ready shares which, at 23s. 6d., are 2s. lower on the week and 5s. lower than they were prior to the announcement of an increased dividend, and the issue of a report which showed the company to be very prosperous. Vickers and other iron and steel shares have conformed to the general trend of markets. Vickers are 1s lower at 15s. 9d. Babcock & Wilcox at 40s. have lost 2s. 6d.

Cable and Wireless

Making every allowance for exceptional circumstances, it still has to be considered that Cable and Wireless ordinary stock has given a poor account of itself since the declaration of the 4 per cent. dividend. At 50, the price has receded this week by a further 2 points, and is as much as 15 points lower than the best of this year. The yield of 8 per cent. is the sort of return expected from investment in business of decidely speculative character. Perplexity exists as to why the stock of a vital enterprise such as the Cable and Wireless group should be found in that category. Possibly there has been selling by people who had previously bought in the expectation of a better dividend than 4 per cent. for 1939, or who thought that that rate might later have been raised but for the intervention of the dividend limitation scheme, which leaves 4 per cent. as the maximum wartime distribution. Possibly, also, people are still mindful of the dreary succession of passed dividends until the topheavy capitalisation was put to rights by the drastic writing down and reorganisation of 1936. Since then, 4 per cent. has been earned and paid on the smaller capital in each year.

No very convincing explanation for the lowly standing of Cable and Wireless (Holding) ordinary stock is to be found in the full accounts published last week by both the operating and the holding companies. The operating concern's total revenue came out at well over a million pounds above the 1938 total; the net figure is up from £1,000,000 to £1,600,000 (subject to E.P.T.), and provides for the increase in the dividend from 3¼ to 4 per cent. Other sources from which the holding company's revenue comes in are, however, iess profitable, notably the Marconi Wireless interest. These served to offset almost entirely the larger revenue received from the operating concern's dividend, with the result that total income proved to be little different than before. The report refers to a restriction of traffic in certain industries now subject to Government control, and a statement appears to the effect that the company has not been immune from the results of wartime measures in commerce generally.

Electrical Switchgear—Metal Industries

The consent of the necessary 85 per cent. of the shareholders in Electrical Switchgear and Associated Manufacturers having been obtained, effect is now given to the unusual deal in which Metal Industries have offered to acquire the Electrical Switchgear shares in exchange for the shares of a third company, namely British Oxygen. Those who have accepted the offer will receive one new British Oxygen share, at present worth about 56s., plus 3s. 9d. in cash, for each three Switchgear shares surrendered. Automatically this makes the latter worth roughly £1. Originally it had been intended to close the offer on Monday of this week, but it is now stated that because of the emergency, Metal Industries may agree to allow further grace.

Brazilian Traction

The Brazilian Traction Light & Power Company is actually a Canadian concern and New York has dealt, in the past, comparatively little in its shares. Lately, Brazilian Tractions have become more of an Anglo-American stock and until an abrupt check was given to optimism by political apprehensions, the shares made a favourite gamble for the bull party. Up to 12¼ earlier this year, the price has now relapsed to 7⅞, with America calling the tune. Latin-Canadian issues are heavy under the influence of financial depression in New York, which has sympathetically affected such utility stocks as Montreal Light and Power common.

Cash Dealings

Crisis times, such as these, bring out the value of the Stock Exchange regulation that every bargain shall be a matter for cash settlement, instead of being done for the normal fortnightly accounts. To this rule can be ascribed much of the calm with which the markets face new situations in the progress of the war. Since last September, bursts of activity have taken place in several markets—notably the home railway section. On these occasions, the rapid interchange of stocks and shares has rendered an immediate settlement a matter of considerable complication and difficulty, resulting in an occasional plea for the restoration of the old system. The concession has not been granted, evidently because of the desire to lend the strongest discouragement to possible speculation. Present-day buyers of stock must have the intention and the wherewithal to pay in cash. Such holders are the least likely to be jolted out of their investments. The existence of any purely speculative position would be a constant source of weakness.

In the face of such happenings as those, for instance, of the past week, it is safe to assume that even heavier falls would have occurred in many prices had there been any open account worth mentioning in the shares. It is hardly necessary to add that a pronounced depression in one market or more has a sympathetic effect upon other parts of the House, and at a time when it is so essential to maintain, in every respect, the national credit, the risk of a blow being struck at it has to be avoided by the use of every possible precaution.

Increased Charges

Discontent has become vocal amongst some of the customers of the London electricity supply companies, who, resenting the additional charges now claimed, are demanding explanations as to why their bills should have increased so much. It is being asked, by holders of certain of the London companies' issues, whether this movement is likely to find reflection in the quotations for the shares, especially in the ordinary class.

It may be repeated that in the cases of the Metropolitan Supply Company and the County of London, a reduction of dividend is considered probable. The County Company has paid 10½ per cent. per annum for some years. The Metropolitan Co. reduced its dividend to 10 per cent. last year, from 12 per cent. paid in each of the two preceding years. London Associated Electric Undertakings, after paying an annual 7 per cent. for several years, lowered this dividend to 5½ per cent. for 1939. There has been a little wishful thinking that possibly the London Associated may restore its dividend, a year hence, to 7 per cent. for 1940.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1940 High-est	1940 Low-est	Dividend Pre-vious	Dividend Last	Middle Price May 21	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies							
Bournemouth and Poole ...	63/6	57/–	15	15	57/6	–¼	5 5 0
British Power and Light ...	30/–	25/3	7	7	26/–	–1/6	5 7 8
City of London	28/–	23/–	7½	7½	23/–	–2/–	6 7 8
Clyde Valley	38/6	33/–	8	8	35/–	–¼	4 11 6
County of London ...	43/3	33/6	10½	10½	33/9	–¼	6 4 4
Edmundson's :							
7% Pref....	31/6	28/–	7	7	31/3	—	4 9 7
Ord.	27/6	21/9	9	6	23/–xd.	–2/–	5 4 4
Elec. Dis. Yorkshire ...	40/3	35/9	9	9	37/6	–¼	4 16 0
Elec. Fin. and Securities ...	41/3	40/–	12½	12½	41/3	—	6 1 0
Elec. Supply Corporation...	46/3	41/–	12	11½	43/9	–¼	5 5 0
Isle of Thanet	16/–	12/6	4	4	13/–	—	6 3 1
Lan s Light and Power ...	33/–	28/6	7½	7½	29/6	–1/9	5 1 8
Llanelly Elec.	21/–	19/6	5½	5½	21/–	—	5 4 9
Lond. Assoc. Electric ...	21/–	17/–	7	5½	17/–	–1/9	6 9 4
London Electric	37/6	25/–	8	7½	25/–	–9d.	5 16 0
London Power Deb. Red....	105½	103	5	5	104½	—	4 15 6
Metropolitan	41/6	33/6	12	10	33/9	–¼	5 18 6
Midland Counties	39/–	32/9	8	8	33/9	–⅛	4 14 10
Mid. Elec. Power	40/–	36/–	8	9	37/6	—	4 16 0
Newcastle Elec.	29/9	26/–	7	7	27/6	—	5 1 10
North Eastern Electric :							
Ordinary...	31/6	26/–	7	7	26/–	—6d.	5 7 8
7% Pref....	32/6	30/–	7	7	30/–	–1/6	4 13 4
Northampton	48/–	41/–	10	10	42/6	–9d.	4 14 1
Notting Hill 6% Pref. (£10)	10⅜	10	6	6	10⅜	—	—
Northmet Power :							
Ordinary...	42/3	32/3	10	10	32/6	–2/6	6 3 1
6% Pref....	29/–	26/9	6	6	27/6	–6d.	4 7 3
Richmond Elec.	24/6	22/9	7	6	23/9	—	5 1 1
Scottish Power	38/–	31/9	8	8	32/6	–⅛	4 18 6
Southern Areas	21/3	18/6	5	5	18/6	–1/–	5 8 1
South London	23/3	22/–	7	7	22/–	–6d.	6 7 3
West Devon	20/–	18/6	5	5	20/–	—	5 0 0
West Glos.	21/3	16/6	2	2½	21/3	—	2 10 0
Yorkshire Elec.	40/–	33/3	8	8	33/9	–⅛	4 14 10
Overseas Electricity Companies							
Atlas Elec.	4/–	2/6	Nil	Nil	2/6	–9d.	—
Calcutta Elec.	37/–	30/–	10*	8*	31/–	—	5 3 3
Cawnpore Elec.	30/–	28/6	10	10	28/–	—	6 19 2
East African Power ...	25/6	23/3	7	7	25/6	—	5 19 10
Jerusalem Elec.	24/–	21/6	7	7	23/–	–1/–	6 1 9
Kalgoorlie (10/–)	12/6	9/6	7½	7	12/–	—	5 16 8
Madras	28/9	26/–	8*	8*	26/3	—	—
Montreal Power	35½	30	1½	1½	30½	–3½	—
Palestine Elec. "A" ...	25/–	21/–	7½*	5*	21/3	–¼	4 14 1
Perak Hydro-electric ...	20/3	15/–	6	2½	15/–	–¼	3 6 8
Shawinigan Power ...	27½	20	83cts.	90cts.	22	—	—
Tokyo Elec. 6%	69	57	6	6	57½	–5	10 8 8
Victoria Falls Power ...	75/9	67/9	12½	15	70/–	–5/–	4 5 9
Whitehall Investments Pref.	17/9	12/6	7½	7½	14/–	–1/–	10 14 4
Public Boards							
Central Electricity :							
1950–70	110½	107	5	5	109	—	4 11 7
1955–75	112½	108½	5	5	111	—	4 10 0
1951–73	107½	103	4½	4½	106	–1	4 5 0
1963–93	96½	90	3½	3½	93½	–1	3 14 10
London Elec. Trans Gtd....	92	87½	2½	2½	91	—	2 15 0
London & Home Counties							
1955–75	113½	106½	4½	4½	107	—	4 4 1
Lond. Passenger Transport							
A	116	104	4½	4½	108½	–2	4 3 0
B	116	103	5	5	108½	–1	4 12 4
C	65½	36½	1½	—	37½	–5	—
West Midland Joint Elec.,							
1948–68	106½	105	5	5	106½	—	4 14 0
Telegraph and Telephone							
American Tel. & Tel. ...	215	190	9	9	190	–22½	4 14 8
Anglo-Am. Tel. :							
Pref.	106	93½	6	6	103½	—	5 16 0
Def.	23⅜	21	1½	1½	22	—	6 16 4
Anglo-Portuguese	22/6	19/9	8	8	20/–	–¼	8 0 0
Cable & Wireless :							
5½% Pref.	99⅜	94	4½	5½	94½	–2	5 16 5
Ord.	65	49	4	4	50	–2	8 0 0
Income	99⅜	93	—	—	99½	—	4 0 5
Canadian Marconi $1 ...	6/–	4/6	Nil	4cts.	5/–	—3d.	—
Globe Tel. & Tel.							
Ord.	32/6	28/6	7½*	7½*	32/6	—	4 12 4
Pref.	28/9	24/6	6	6	27/6	—	4 7 3
Great Northern Tel. (£10)...	20	11	20	20	13	—	15 7 8
Inter. Tel. & Tel.	5½	3	Nil	Nil	3	–1½	—
Marconi-Marine	30/–	23/6	10	7½	23/9	–¼	6 6 4
Oriental Telephone Ord. ...	2⅞	53/6	12*	11½*	2⅜	—	4 3 8
Telephone Props.	15/–	13/3	5	6	15/–	—	8 14 6
Telephone Rentals (5/–) ...	9/6	7/6	10	10	8/–	–9d.	5 6 5
Traction and Transport							
Anglo-Arg. Trams :							
First Pref. (£5)	4/3	3/3	Nil	Nil	4/–	—	—
4% Inc.	11½	7½	Nil	Nil	9½	–2	—
British Electric Traction :							
Def. Ord.	830	500	5	5	525	—	—
Pref. Ord.	169	147	8	8	165	—	4 17 0
Bristol Trams	48/6	42/–	10	8*	43/9	—	3 13 1
Brazil Traction	12½	7½	$1	50c.	7⅜	–1⅜	—
Calcutta Trams	24/–	22/6	8	8	23/6	—	6 16 2
Cape Elec. Trams	18/6	16/–	5	5	18/6	—	5 8 1
Lancs Transport	35/–	28/3	10	10	35/–	—	5 14 8
Mexican Light :							
1st Bonds	33	28	5	5	30½	—	—
Rio 5% Bonds	90	74	5	5	80	—	6 5 0
Southern Rly. :							
5% Prefd.	79	51	5	5	55	–11	9 1 10
5% Pref....	104½	89⅜	5	5	94½	–4	5 5 10
T. Tilling	45/9	36/–	10	10	37/6	–4/6	5 6 8
Tilling & B.A.	47/6	43/9	9*	8*	47/6	—	3 7 10
West Riding	35/–	28/6	10	10	33/0	–1/–	6 1 3
Equipment and Manufacturing							
Aron Electricity Ord. ...	17/6	15/0	15	15	17/6	—	—
Assoc. Elec.:							
Ord.	43/3	37/6	10	10	37/6	–½	5 6 8
Pref.	35/3	32/3	8	8	35/–	—	4 11 5
Automatic Telephone & El.	47/3	42/–	12½	12½	45/–	—	5 11 1
Babcock & Wilcox ...	50/–	39/6	10	11	2	–½	5 10 0
British Aluminium Ord. ...	56/–	43/6	12½	12½	43/9	–½	5 14 3
British Insulated Ord. ...	92/6	78/9	20	20	86/3	–½	4 12 10
British Thermostat (5/–) ...	14/9	11/9	18½	18½	12/6xd.	–3d.	7 8 0
British Vacuum Cleaner (5/-)	12/6	8/6	40	12½	10/–	—	6 5 0
Brush Ord....	4/6	3/–	Nil	Nil	3/3	–3d.	—
Callender's	60/–	59/6	20	15	60/–	–½	5 0 0
Chloride Elec. Storage ...	72/6	68/–	20	15	3⅜	—	4 2 9
Consolidated Signal ...	72/6	59/–	36½	17	3⅜	—	4 13 10
Crabtree (10/–)	24/9	21/–	17½	17½	23/9	—	7 7 4
Crompton Parkinson :							
Ord. (5/–)	20/–	15/–	15	20	15/–	–½	6 13 4
E. K. Cole (5/–)	5/–	3/3	10	Nil	4/–	—	—
Elec. & Musical Industries (10/–)	10/3	7/9	5	Nil	8/–	–9d.	—
Electric Construction ...	36/3	32/6	12½	13½	35/–	—	7 14 2
Enfield Cable Ord. ...	56/–	46/3	25	16½	51/3	–¼	6 3 6
Electrical Switchgear (10/–)	22/6	20/–	16	10	20/–	—	5 0 0
English Electric	33/9	29/6	10	10	30/–	–¼	6 13 4
Ensign Lamps (5/–) ...	15/3	13/9	25	25	13/9	—	9 1 10
Ericsson Tel. (5/–) ...	39/3	33/9	25*	25*	33/9	—	3 14 1
Ever Ready (5/–)	28/3	23/–	30	40	23/6	–2/–	8 10 2
Falk Stadelmann	18/3	17/6	10	6	17/6	—	6 17 4
Ferranti Pref.	25/–	23/–	7	7	25/–	—	5 12 0
G.E.C. :							
Pref.	32/6	28/–	6½	6½	32/–	—	4 1 3
Ord.	83/3	74/3	17½	20	76/–	–4/–	5 5 3
Greenwood & Batley ...	25/6	23/9	15	15	23/9	—	12 12 8
Hall Telephone (10/–) ...	18/6	15/–	15	10	15/–	—	6 13 4
Henley's (5/–)	21/6	17/3	20	20	17/6	–6d.	5 14 3
4½% Pref.	21/3	20/6	4½	4½	21/3	—	4 4 8
Hopkinsons	46/9	42/6	12½	15	43/9	—	6 17 0
India-Rubber Pref. ...	21/–	20/3	5½	5½	20/9	—	5 6 0
Intl. Combustion	121/3	105/–	32½	32½	5⅜	–⅛	5 15 9
J. Lucas	60/6	53/3	15	15	57/6	—	5 4 5
Johnson & Phillips ...	50/9	42/3	12½	15	46/3	—	5 8 3
Lancashire Dynamo ...	59/9	53/–	25	20	55/–	—	7 5 6
Laurence Scott (5/–) ...	11/–	9/3	15	15	9/6	—	7 17 10
London Elec. Wire ...	25/6	25/–	12	7½	25/–	—	6 0 0
Mather & Platt	46/6	36/3	13½	10	38/3	–1/9	5 4 7
Metropolitan Elec. Cable Pf.	22/–	21/3	5½	5½	21/3	—	5 3 6
Murex	86/9	73/6	20	20	73/9	–⅜	5 8 5
Pye Deferred (5/–) ...	9/–	7/–	25	25	9/–	—	13 17 9
Revo (10/–)	20/9	16/3	17½	17½	17/6	—	10 0 0
Reyrolle	60/6	55/–	12½	12½	55/–	–½	4 11 0
Siemens Ord.	23/9	19/6	7½	7½	21/3	–¼	7 1 2
Strand Elec. (5/–) ...	2/3	1/9	10	4	2/–	—	10 0 0
S. Smith (1/–)	8/–	7/–	37½	50	7/6	—	6 13 4
Switchgear & Cowans (5/–)	11/9	7/6	20	10	10/–	—	5 0 0
Telegraph Condenser (10/–)	8/9	6/3	5	—	8/9	—	—
Telegraph Construction ...	42/6	32/6	10	10	37/6	—	5 6 8
Telephone Mfg. (5/–) ...	9/–	7/9	9	9	8/–	–6d.	5 12 6
Tube Investments... ...	96/9	87/9	23⅜	23⅜	90/–	–½	5 6 6
Vactric (5/–)	3/6	2/–	4	Nil	3/3	—	—
Vickers (10/–)	22/–	15/6	10	10	15/9	–1/–	5 6 7
Ward & Goldstone (5/–) ...	19/9	19/3	20	20	19/9	—	5 1 3
Westinghouse Brake ...	46/–	32/9	17½	10	41/3	–½	4 17 0
Walsall Conduits (4/–) ...	26/6	23/9	55	55	26/3	—	8 7 8
West, Allen (5/–)	7/–	5/–	10	7½	5/6	—	5 15 5

* Dividends are paid free of Income Tax.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), Great George Street, London, S.W.1.

Australia.—NEW SOUTH WALES.—October 24th. Sydney County Council. 50,000 kW turbo-generator. (See p. 550, May 17th issue.)

MELBOURNE.—June 25th. State Electricity Commission of Victoria. V.i.r. cables. (T. 19369/40.)*

June 25th. Cable. (T. 19609/40.)*

July 23rd. Voltage regulating equipment. (T. 19531/40.)*

Beckenham.—June 10th. Electricity Department. Coal supply. (See this issue.)

Blackpool.—May 27th. Electricity Department. Street lighting fittings. (May 17th.)

Belfast.—June 7th. Electricity Department. Underground cables, pilot and telephone cables, 33-, 22- and 6.6-kV switchgear and cabling and three-phase low-voltage switchgear. (See this issue.)

Bournemouth.—May 27th. Borough Engineer's Department. 200 or alternatively 400 BS/A.R.P.37 lighting units and a similar quantity of pole brackets. (May 17th.)

Cardiff.—May 27th. Electricity Committee. Substation, Heath estate. Spec. from G. H. Whitaker, city architect, City Hall.

Edinburgh.—May 31st. Electricity Department. Installation of electric lighting for auditorium and platform in Usher Hall. Forms from Engineer's Office, Dewar Place (£1 1s.); tenders to Town Clerk.

Edmonton.—May 25th. Borough Education Committee. Maintenance of the electrical installations and cleaning of fittings at the Committee's schools, offices, and clinics for the year ending June 30th, 1941. Form of tender from W. L. Brown, director and secretary, Education Offices, Brettenham Road, N.18.

Exeter.—June 7th. Electricity Department. Coal-handling plant. (See this issue.)

Isle of Wight.—May 28th. County Council. Electrical installation at Whippingham school. S. Gregson, county architect, Newport (deposit £1 1s.).

Macclesfield.—June 13th. Electricity Department. E.h.v. and l.v. cables. (May 10th.)

Manchester.—May 27th. City Council. Supply and erection of material for the conversion of three passenger lifts on consumers' premises. Particulars and specification (No. 739), from H. C. Lamb, Electricity Department, Town Hall.

May 27th. Public Health Committee. Washing machine, motor and shafting, and a motor-driven hydro-extractor, at the Institution at Withington. Particulars from the city architect, Town Hall (deposit £1 1s.).

June 7th. Electricity Committee. Ash- and coal-handling plant. (See this issue.)

Morocco.—RABAT.—June 11th. Director of Posts, Telegraphs and Telephones. Static rectifier. (T.19593/40.)*

Newark-on-Trent.—June 15th. Electricity Department. 11-kV metal-clad ring main unit and a 50-kVA transformer. (See this issue.)

New Zealand. — WELLINGTON.—Posts and Telegraph Department. June 20th. 1,800 lb. of insulating and sealing compound. (T. 19165/40.)*

June 25th. Public Works Department. One 11-kV outdoor-type oil-immersed circuit-breaker. (T.Y. 18700/40.)*

Switchgear, &c. (T. 19182/40.)*

July 9th. Three 4,500-kVA voltage regulating transformers. (T. 19163/40.)* One 4,500-kVA voltage regulating transformer. (T. 19162/40.)*

July 16th. Equipment for the remote control of switchgear and transformers at Mt. Roskill substation from Penrose substation. (T. 19161/40.)*

Nottingham.—May 28th. Town Council. Refrigerating plant at the City Hospital. Specification from Mr. J. E. Richards, Town Clerk, Guildhall.

Sheffield.—June 5th. Electricity Department. Two 15,000-kVA transformers. (May 10th.)

South Africa.—PRETORIA.—June 5th. Public Works Department. Boilers, stokers, &c., at Ladysmith Hospital. (T. 19221/40.)*

JOHANNESBURG.—June 12th. City Council. Two 1,500-A, 600-V, DC current limiters. (T. 19392/40.)*

June 15th. Cable and boxes. (T. 19400/40.)*

July 10th. Ten l.v. switchboards. (T. 19395/40.)*

June 7th. 88-kV underground cables (contract No. 16). (T. 19463/40.)*

June 12th. Fire alarm thermostats. (T. 19639/40.)*

June 13th. — Insulating tape. (T.19637/40.)*

CAPE TOWN.—July 3rd. Electricity Department. Secondary battery and battery charging equipment. (T.19635/40.)

PORT ELIZABETH.—June 20th. Battery-driven tower wagon and l.v. cable. (T.19657/40.)*

Stourbridge.—June 8th. Upper Stour Valley Main Sewerage Board. Periodical examination and testing of electrically operated pumping plant at sewage pumping stations. Particulars from the Board's engineer, G. P. Deeley, 13, Church Street.

Orders Placed

Bedford. — Electricity Committee. Accepted. Electric pump (£133).—W. H. Allen, Sons & Co., Ltd. Revised tenders: Three-phase and single-phase switchboards, including tripping battery at Shakespeare Road substation, £1,546 — Ferguson, Pailin. Circuit-breaker at Allhallows Lane substation, £282.—B.T.H. Co. The revised tenders are, in the aggregate, £42 lower than those originally selected. Foster Road substation: Three-phase switchgear and tripping battery (£958). — Met.-Vick Elecl. Co.; single-phase switchgear (£1,252)—Ferguson, Pailin. Ampthill Street substation: Three-phase switchgear and tripping battery (£1,393)—Met.-Vick Elecl. Co.; single-phase switchgear (£870).—Ferguson, Pailin.

Blackpool.—Gas Committee. Accepted.

Financial Section (*Concluded from page 576*)

Reports and Dividends (continued)

of the war. The significance of these installations was in the uses to which they might be put. As an auxiliary service, in cases of emergency or the interruption of the cables, they should add greatly to the flexibility of the system, bringing to the Colonial Empire the advantages already existing on the main lines of their traffic. Long before they met next year they might be able to report that every cable station in the Colonies was equipped with wireless. There would then be a complete dual system of cable and wireless chains throughout the system, and this augmentation of services, supplementary and complementary to each other, would have been accomplished in under 20 months.

With the outbreak of war they had reduced the urgent Press rate to half, and to meet the case of the Forces from the Dominions and Colonies and other parts of the Empire, they had introduced the Expeditionary Force message at 2s. 6d., or half the Empire social telegram charge. Sir Edward referred to the foreign telegraph companies operating in this country, and mentioned that they were free from the restrictions imposed on Cable and Wireless. Their company was the pioneer of overseas communications, and it was British vision, imagination and enterprise that made British communications predominant throughout the world. That was a position which could not be maintained if facilities were given to the foreigner in this country which they would not give to us in theirs.

Cable & Wireless (Holding), Ltd., reports a revenue for 1939 of £1,376,662, an increase of £42,462 as compared with 1938, and a net profit of £1,218,427 (against £1,203,671). The ordinary dividend is maintained at 4 per cent., and £226,223 is carried forward (against £205,282 brought in).

The Eastern Extension, Australasia & China Telegraph Co. reports an income of £338,749 for 1939, as compared with £295,632 for the previous year, and a net profit of £301,011 (against £259,437). The ordinary dividend for the year is 7½ per cent. (against 7 per cent.), and £2,597 is carried forward (against £1,586 brought in).

Taylor Tunnicliff (Electrical Industries), Ltd., reports a consolidated net trading profit and sundry income for 1939 of £76,492. After charging directors', fees, depreciation, income tax, N.D.C. and other expenses, there remains £43,333, out of which the operating companies have paid dividends of £33,285. After deducting administration charges, the preference dividend and an ordinary interim dividend of 2½ per cent., less tax, there is a balance of £19,604. The directors recommend a final dividend on the ordinary shares but it is not possible to state at this juncture what the amount will be. The position as regards liability to excess profits tax remains obscure, and since the company may also be affected by the recent proposals for the limitation of dividends, the directors consider that the payment of such final dividend should be deferred until these matters have been clarified. It is proposed, after transacting the other business of the first ordinary general meeting, to adjourn the meeting to a later date, a notice of which, stating the amount of dividend so recommended, will be sent to members in due course.

Edmundsons Electricity Corporation, Ltd., reports a net profit of £578,789 for 1939, a decrease of £10,009 as compared with 1938. The balance is struck after providing for tax and loan and debenture service. The total dividend on the ordinary stock for the year is again 6 per cent., less tax, and £158,130 is carried forward (against £133,161 brought in). At the annual meeting on May 28th a resolution will be submitted to increase the capital to £11,500,000 by the creation of 1,500,000 new £1 shares. Of the present authorised amount of £10,000,000, a total of £8,663,685 has been issued.

The Harland Engineering Co., Ltd., reports a trading profit for 1939 of £51,466, as compared with £23,407 for the preceding year, and a net balance of £19,385 (against £21,946). General reserve receives £5,000, pensions £1,000, and A.R.P. £3,000. The ordinary dividend for the year is 7 per cent., and £14,575 is carried forward (against £14,367 brought in).

Telephone Properties, Ltd., reports a net profit for 1939 of £37,169, as compared with £53,108 for 1938. The dividend on the ordinary stock for the year is maintained at 6 per cent., less tax.

The Telephone Manufacturing Co., Ltd., is paying a final dividend of 6½ per cent., again making 9 per cent. for the year (same).

Internal telephone installation at Marton gasworks.—R. Darbyshire, Ltd.

Bolton.—Electricity Committee. Accepted. Switchgear for power station extension.—Met.-Vick Elecl. Co.

Brighton. — Electricity Committee. Recommended. New steam raising units at Southwick power station (£54,100).—Babcock & Wilcox.

Darlington.—Town Council. Accepted. 150-kW rectifier for the Haughton Road substation (£572).—Hewittic Electric Co.

Gateshead.—Town Council. Accepted. Electrical installation at the new nurses' home (£614).—Thomas Sloan.

Hastings. — Electricity Committee. Recommended. Two 200-kVA transformers (£763).—Ferranti.

Plymouth. — Electricity Committee. Accepted. Conveyor belt for Prince Rock power station (£256).—British Tyre & Rubber Co., Ltd.

Rawtenstall.—Electricity Committee. Accepted. Cables for twelve months.—Henley's.

Westmorland.—Education Committee. Accepted. Electric lighting at the Thore and Ormside schools.—D. Macrae.

Wolverhampton.—Water Committee. Accepted. Electrical pumping machinery for Goldthorn Hill waterworks (£695).—John Thom, Ltd.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alsager and Kidsgrove.—New housing scheme; H. V. Lynam, U.D.C. surveyor.

Blackburn.—Central service bus station, site of old gasworks, for T.C.; borough engineer.

Blackpool.—Houses (22); borough engineer.

Bolton.—Salvage plant (£33,359); Petrie & McNaught, Ltd.

Bromsgrove.—Hall, Perryfields estate, Sidemoor, for Bishop of Worcester's Appeal Fund; W. Weaver, Ltd., contractors, The Strand, Bromsgrove.

Buckinghamshire.—Buildings at County Demonstration Farm, Weston Turville (£6,449); county architect, County Offices, Aylesbury.

Burnley.—Pithead baths at Hapton Valley Colliery (Hargreaves Collieries, Ltd.), Padiham, for Miners' Welfare Central Fund Committee, Romney House, Tufton Street, London, S.W.1; W. Livesey & Sons, Ltd., contractors, Nova Scotia Works, Blackburn.

Cheltenham. — Licensed premises, Orchard Way; Cheltenham Original Brewery, Ltd.

Depôt, Francis Street; Birmingham Waste Co., Ltd.

Additions, Sunningend works; H. H. Martyne, Ltd.

Cheshire.—First portion of new technical college at Northwich (£42,305), and technical college at Crewe (£61,908); F. Anstead Browne, county architect, The Castle, Chester.

Seven blocks at Clatterbridge General Hospital; county architect.

Chesterfield.—Sewage disposal works, Eckington, for R.D.C.; surveyor, Council Offices.

Chester-le-Street. — Sewage works at South Pelaw for the U.D.C.; Alston Limestone Co., Ltd., builders, Blackett Street, Newcastle-on-Tyne.

Clay Cross. — Headquarters, for Y.M.C.A.; J. Brown, secretary.

Coatbridge. — Extensions to machine shops (£1,200) for Martin, Black & Co. (Wire Ropes), Ltd., Speedwell; the manager.

Cockermouth.—Houses on the Seaton estate; R.D.C. surveyor.

Coventry.—Junior and infants' school on Cheylesmore estate; D. E. E. Gibson, city architect, 2a, Warwick Road.

District fire stations, Sir Henry Parkes Road, By-pass Road, and Lythalls Lane; city engineer.

Darlington. — Office block for new factory in Allan Street for Thecla Engineering Co., Ltd.; T. Rodger & Son, builders, Valley Street, Darlington.

Further public shelters (£3,139) and school shelters (£5,053); borough engineer.

Derbyshire. — Proposed children's home, Holymoorside, Chesterfield; county architect, St. Mary's Gate, Derby.

Dewsbury. — Rebuilding Crown Oil Works, Leeds Road, for Ramsden, Son & Greenwood.

Houses, off Alderney Road, for W. Wormald & Son.

Droitwich. — Additions to Highfield Hospital, for Birmingham Hospital Saturday Fund, Newhall Street, Birmingham, 3.

Dumbarton.—Two fire stations (£44,000); clerk to the County Council.

Eire. — COUNTY KILDARE. — Vocational school at Prosperous, Co. Kildare; J. V. Downes, architect, 53, Fitzwilliam Square, Dublin.

KERRY.—Technical school at Dingle; Buttimer & Co., Tralee.

COUNTY CORK.—Church at Carrigaline, for Rev. D. M. O'Flynn; E. P. O'Flynn, architect, 60, South Mall, Cork.

Elham (KENT). — Fire station, near Council Offices, for R.D.C.; surveyor, Council Offices, Lyminge.

Gateshead.—Additions to bakery, Hill Road, for Gateshead Industrial and Co-operative Society; C.W.S. Building Department, West Blandford Street, Newcastle-on-Tyne.

Glasgow.—Extension to pattern shop, for G. & J. Weir, Ltd., 149, Newlands Road; the manager.

Extension to substation for Harland & Wolff, Ltd.; Sir Wm. Arrol & Co., Ltd., 85, Dunn Street.

Church hall at Pollok for Church of Scotland Church Extension Committee; secretary, 121, George Street, Edinburgh.

Glastonbury.—Extensions to sawmills, for John Snow & Co., Ltd.

Godstone.—Hostels; surveyor, R.D.C. Offices.

Grantham.—Factory, Springfield Road; British Manufacturing & Research Co., Ltd.

Hampshire.—Laundry and workshops, Mount Colony (£7,000); county architect, Winchester.

Hendon.—Extensions to isolation hospital, and additions to central fire station; A. O. Knight, engineer and architect, Town Hall, N.W.4.

Kent.—Development, mental colony, Leybourne; technical college, Fort Pitt (£30,000); and completion of Central school, Sevenoaks (£14,503); county architect, Sessions House, Maidstone.

Works; Imperial Chemical Industries, Ltd.

Lancashire.—Conversion of garage into offices and stores (£4,500); county architect, County Offices, Preston.

Lancaster.—Works, Caton Moor; Caton Brickworks Co.

Lincolnshire.—Maternity and child welfare clinic at Long Sutton; W. M. Smith, county architect, County Offices, Boston.

Liverpool.—Hospital at Mossley Hill, Liverpool; Moston Brick and Building Co., Ltd., contractors, Kenyon Lane, Moston, Manchester.

London. — ALDWYCH. — Re-equipping Lyceum Theatre, for Tom Arnold and Harry Foster; Ronald S. Morris, architect, 1a, Beaumont Street, Weymouth Street, W.1.

Manchester.—Additions to works canteen for I.C.I., Ltd. (Dyestuffs Group), Hexagon House, Blackley.

Extension to canning factory, 15-25, Medlock Street; G. Noel Hill, city architect, Town Hall.

Additions to factory, Collyhurst Road, Collyhurst, for W. C. Jones, Ltd., Collyhurst Road; Moseley Construction Co., Ltd., contractors, Sherbourne Street, Strangeways.

Hotel, Lightbowne Road, Moston, for Chesters Brewery Co., Ltd., Ardwick, Manchester; G. & W. Smith (Builders), Ltd., contractors, Hyde Grove, Plymouth Grove, Chorlton-on-Medlock, Manchester.

Additional buildings at Barnes Convalescent Home, Cheadle, for the Royal Infirmary Board of Management; Thomas Worthington & Sons, architects, 178, Oxford Road, Manchester.

Works, 1-11, Robinson Street, Tipping Street, Ardwick, for David Moseley & Sons, Ltd., Ardwick; Oakley & Sanville, architects, 60, King Street.

Boiler house, for Morgan, Crossley & Co., Ltd., Ducie Mills, Miles Platting; William Gornall & Sons, Ltd., contractors, Gore Street, Salford, 3.

Merthyr.—Houses (78); borough engineer, Merthyr Tydfil.

Middlesbrough. — Cleansing station, Eastbourne Road; C. Gorman, borough engineer.

Morley (YORKS).—Works extension, Springfield Mill, for Hield Bros.

Additions to Alexandra Mills, Baker Street, for W. B. Stockwell.

Nantwich.—Additions to factory for Trufood, Ltd., Wrenbury, near Nantwich.

Newcastle-on-Tyne. — Extensions to bakery in Shields Road, for Joseph Dobson, Ltd.; Stephenson & Gillis, architects, Saville Chambers, Newcastle.

North Walsham.—Factory, Millfield Works, for Norfolk Tanneries, Ltd.; J. S. Bain, architect, Swafield, North Walsham.

Northwich.—Extensions to fire station in Brockhurst Street, for the U.D.C.; F. L. James, surveyor, The Council House, Northwich.

Nottingham.—Pithead baths at Annesley Colliery, for Miners' Welfare Central Fund Committee, Romney House, Tufton Street, London, S.W.1; H. James, Ltd., contractors, Central Joinery Works, Station Street, Mansfield.

Oldham.—Large extensions to Woodstock Mills, Higginshaw, Oldham; E. P. Mawson, architect, 13, Victoria Street, London.

Plymouth.—Completion of Montpelier school (£50,432) and housing schemes (£70,000); Education Committee.

Reading.—Houses, Whitley estate; J. S. Paton, architect, Town Hall.

Rochdale.—Completion of market scheme (shops and arcade); borough engineer.

Runcorn.—Houses (21), for agricultural workers; surveyor, R.D.C. offices.

Scunthorpe.—Pumping station, Roxby, for North Lindsey Water Board; W. Farrar, engineer, Council Offices, Scunthorpe.

Sheffield.—Dairy, Handsworth Road, for Brightside & Carbrook Co-operative Society, Ltd., Exchange Street, Sheffield, 1.

Southampton.—Police station, Ascupart Street; S. G. Stanton, borough engineer, Civic Centre.

Swansea.—Water purification works (£6,500); Binnie, Deacon & Gourley.

Nurses' home and ward building, Hill House Hospital; borough engineer.

Warrington. — Extensions to crane works, for the Whitecross Co., Ltd., Milner Street, Warrington.

Welwyn Garden City.—General hospital (£36,200), for U.D.C.; William A. Pite, Son & Fairweather, architects, 12, Carteret Street, S.W.1.

Wolverhampton.—Factory additions, Park Lane; Marcus & Brown.

Factory additions, Stewart Street; Davies Bros. & Co., Ltd.

Rebuilding Rough Hills Tavern, Rooker Rd.; A. T. & Bertram Butler.

Worksop.—Pithead baths at Shireoaks Colliery (Shireoaks Colliery Co., Ltd.), for Miners' Welfare Central Fund Committee; T. Beighton, Ltd., contractors, Brimington, Chesterfield.

Trade Mark Applications

AMONG recent applications for British trade marks are the following, objections against any of which may be entered within one month from May 15th:—

Epic. No. 610026. Class 9 (IV). Electric bells and connectors, contact devices, distribution boards and boxes, relays, safety fuses (cut-outs), switchboards, fuse boards, terminals, transformers, bell pushes, combination switches and plugs, junction boxes, wall sockets and plugs, all for electrical purposes.—General Accessories Co., Ltd., 18-22, Euston Buildings, Gower Street, N.W.1.

Heatrae. No. 601641. Class 11 (IV). Electric heating apparatus and materials, electric drying ovens, hotplates, warming plates, electric cooking, boiling, grilling, toasting and frying stoves and ranges, electric distilling apparatus (except experimental stills) and sterilising apparatus.—Heatrae, Ltd., Heatrae Works, St. George's Street, Norwich.